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PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOU--ETC(U)
1963

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1 OF 2
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Plan for Development of the Land and Water Resources of the Southeast River Basins

1960

1975

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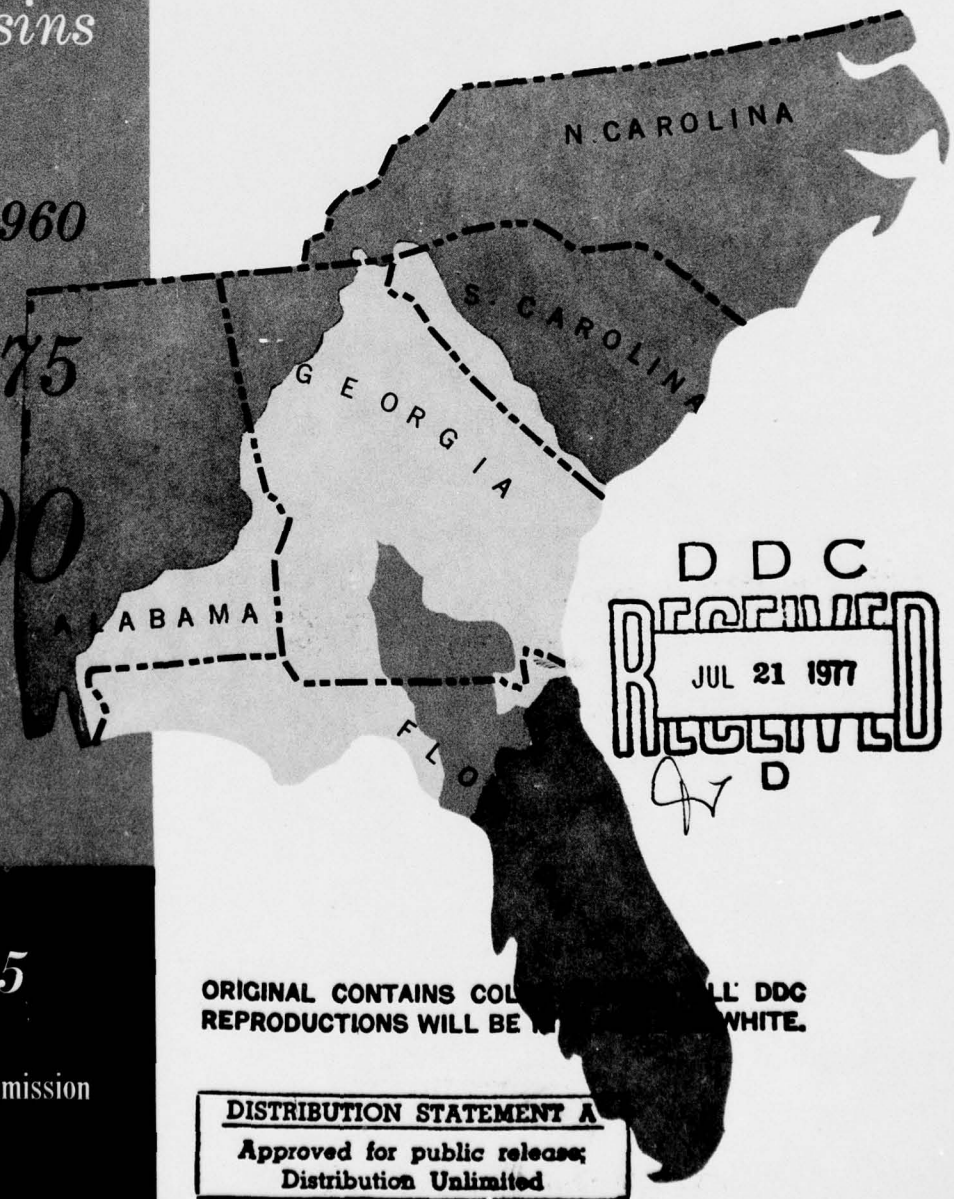
SUWANNEE BASIN



APPENDIX 5

To report of...

United States Study Commission

Southeast River Basins

1963

(6)

PLAN FOR DEVELOPMENT OF THE LAND AND WATER RESOURCES OF THE SOUTHEAST RIVER BASINS.

Appendix 5.

SUWANNEE BASIN.

(9) Final rept.

(12) 165 p.

(11) 1963

APPENDIX 5

TO REPORT OF

UNITED STATES STUDY COMMISSION

SOUTHEAST RIVER BASINS

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FOREWORD

This Appendix summarizes the results of studies made in formulating a comprehensive plan for the conservation, utilization, and development of the land and water resources of the Suwannee basin. The plan for the Suwannee basin is a part of the comprehensive plan for the development of the land and water resources of the Southeast River Basins.

Data relevant to the development of the land and water resources of the Suwannee basin are summarized in six interrelated parts. The matter contained in each part is pertinent to the comprehensive plan. The reader is urged to consider the Report in the aggregate rather than to consider selected material out of context.

Part One includes a description of the area, a discussion of its resources, and a presentation of the present and future population and economy. Part Two presents the level of needs by purpose. Part Three describes planning procedures as applied to this study. Part Four presents the comprehensive plan, including a separate listing of improvements warranting early action, for the Suwannee basin; Part Five contains the conclusions; and Part Six acknowledges the assistance of public and private agencies and individuals.

The Report of the United States Study Commission summarizing the plan for the Southeast River Basins is made in response to the provisions of Public Law 85-850 (72 Stat. 1090) dated August 28, 1958, which established the United States Study Commission, Southeast River Basins. Public Law 85-850 is reproduced in Appendix 13.

The authorizing Act provides for an integrated and cooperative investigation to formulate a comprehensive and coordinated plan for:

(1) Flood control and prevention;

(2) domestic and municipal water supplies;

(3) the improvement and safeguarding of navigation;

(4) the reclamation and irrigation of land, including drainage;

(5) possibilities of hydroelectric power and industrial development and utilization;

(6) soil conservation and utilization;

(7) forest conservation and utilization;

(8) preservation, protection, and enhancement of fish and wildlife resources;

(9) the development of recreation;

(10) salinity and sediment control;

(11) pollution abatement and the protection of public health; and

(12) other beneficial and useful purposes not specifically enumerated in the Act.

The comprehensive plan for the Southeast River Basins is formulated to meet the needs of the area for land and water resources development to the year 2000. Projects and programs existing and under construction in 1960 are included in the plan, but only 1960-2000 developments are analyzed.

The plan for the development of the resources of the Southeast River Basins and the Suwannee basin is the result of cooperative work of Federal, State, and local and private agencies having interest in the area and knowledge of its needs and requirements. Public hearings were held early in the planning process to obtain firsthand knowledge of conditions and problems in the study area and to secure suggestions for their solution. Throughout the study, liaison was maintained with interested groups and agencies by means of conferences and committee and advisory group meetings. When a tentative plan was developed, public presentations were made by the Commission to inform interested persons and organizations and to request comments. These comments were considered in preparing the final plan and Report.

Although many individuals, groups, and agencies have participated in the studies, the Commission takes full responsibility for the plan and for the projections, assumptions, and analyses on which it is based.

The Commission plan for the Southeast River Basins is supported by data contained in 13 appendixes. Data on the plan for development of the resources in the eight geographic areas

studied in the Southeast River Basins are contained in Appendixes 1 through 8. Technical data and information applicable to both the entire study area and the several geographic areas are contained in Appendixes 9 through 13. The appendixes to the Commission Report are as follows:

Appendix	Title
1	Savannah Basin
2	Ogeechee Basin
3	Altamaha Basin
4	Satilla-St. Marys Basins
5	SUWANNEE BASIN
6	Ochlockonee Basin
7	Apalachicola-Chattahoochee-Flint Basins
8	Choctawhatchee-Perdido Basins
9	Economics
10	Hydrology
11	Engineering and Cost
12	Planning
13	History and Organization of the Commission

U. S. STUDY COMMISSION
SOUTHEAST RIVER BASINS

APPENDIX 5
SUWANNEE BASIN

CONTENTS

CONTENTS—Continued

CONTENTS—Continued

CONTENTS—Continued

PART FIVE – CONCLUSIONS

PART SIX – LOCAL, STATE, AND FEDERAL PARTICIPATION AND ASSISTANCE

ILLUSTRATIONS
(some titles are abridged)

CONTENTS—Continued

* Photograph

CONTENTS—Continued

TABLES

* Photograph

CONTENTS—Continued

THE SOUTHEAST RIVER BASINS

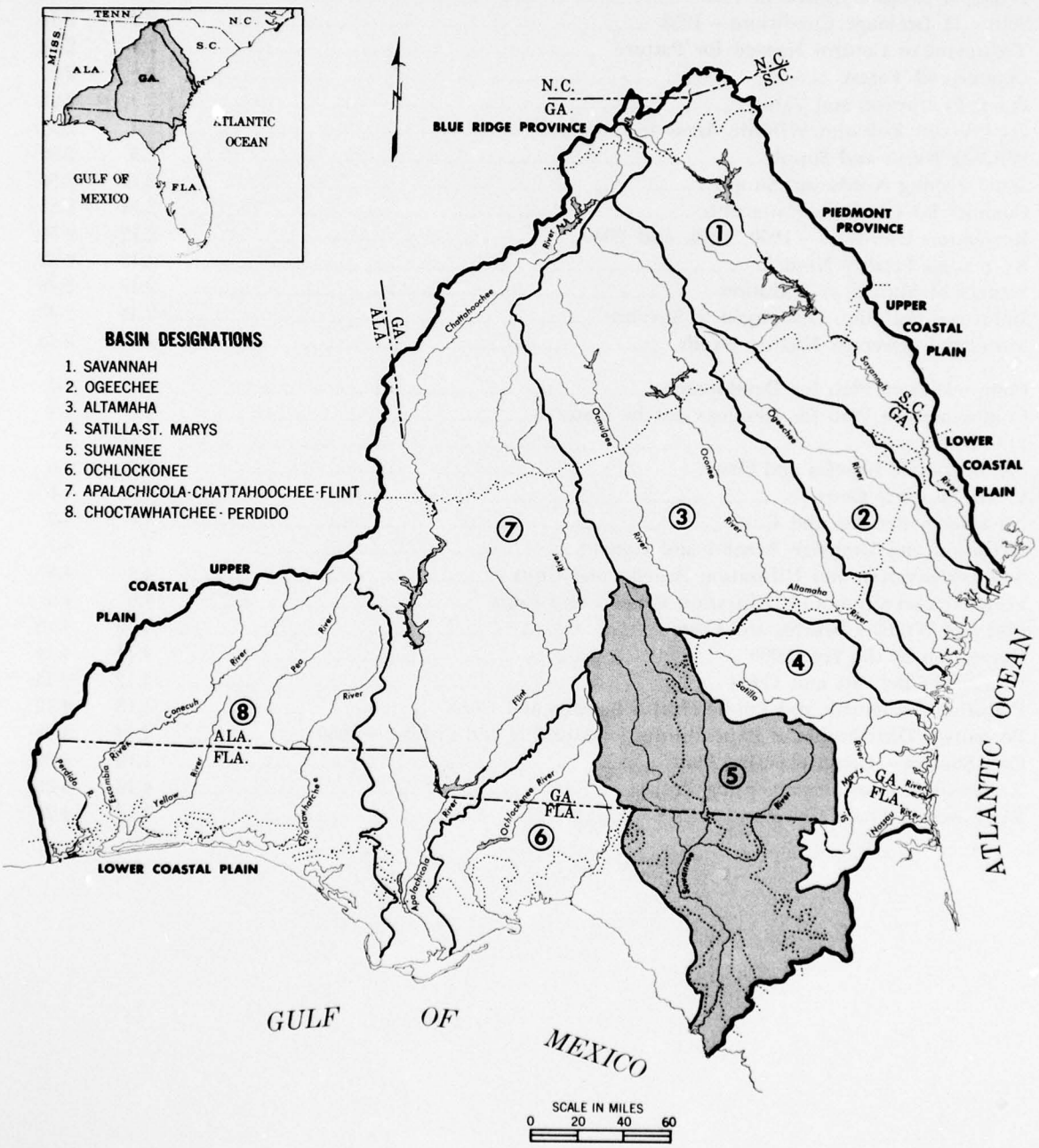


Figure 1.1

THE SUWANNEE BASIN

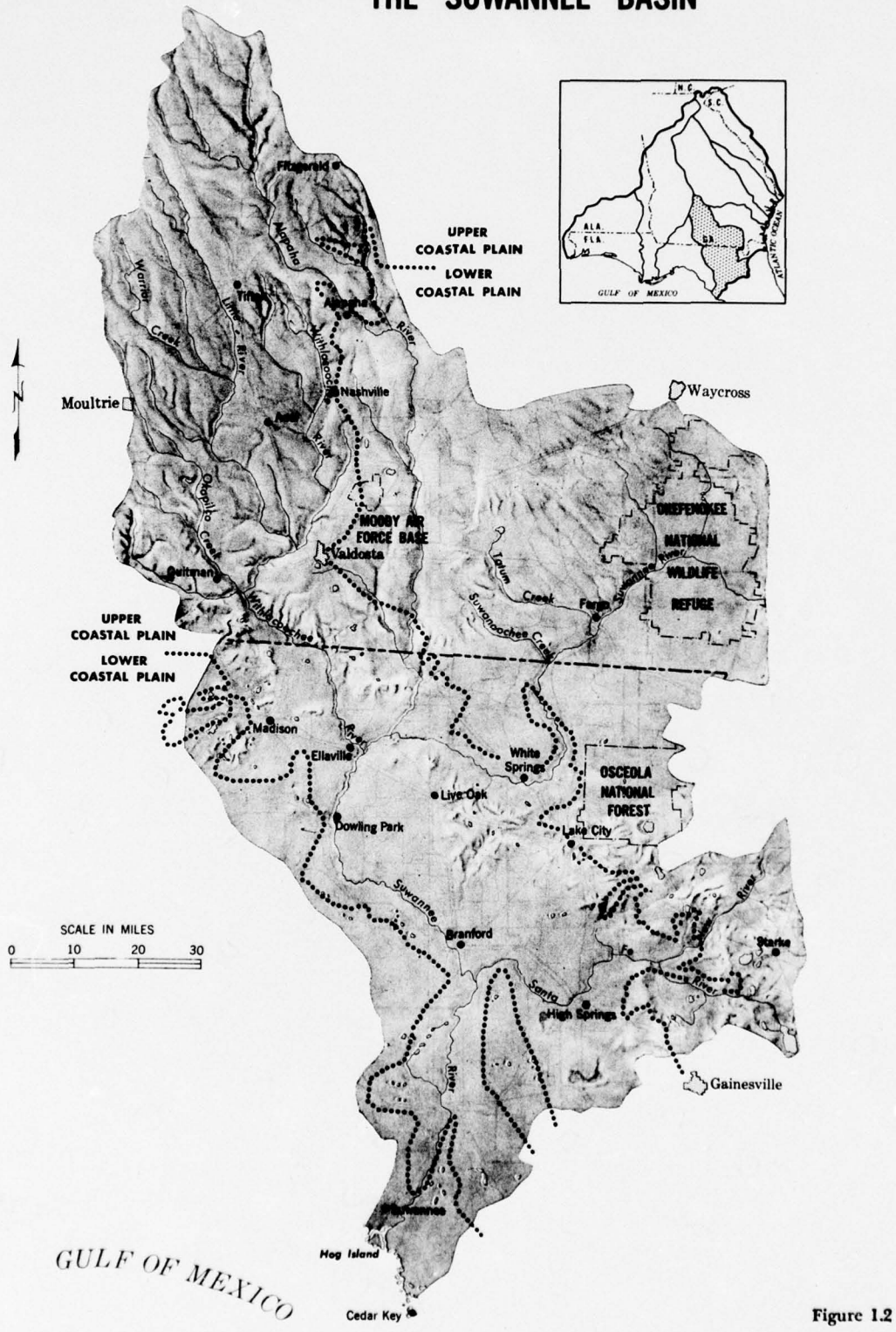


Figure 1.2

PART ONE – STAGE FOR DEVELOPMENT

SECTION I – BASIN AREA

Description

Although Stephen Foster may never have seen the Suwannee River, he accurately portrayed it, in song, as a placid stream coursing an area of pleasant and satisfying living. The Suwannee basin streams and their environs are just as beautiful today as they were 150 years ago. The climate is just as pleasant. The productive potential of the land is just as great.

The 11,020 square miles in the basin are about equally divided between south-central Georgia and north-central Florida. Valdosta, Georgia, with a 1960 population of nearly 31,000, is the largest city in the basin.

North of the Georgia-Florida State line, in the western part of the basin, are the low, rolling hills of the Georgia portion of the Upper Coastal Plain. This area, which is drained by the Alapaha and Withlacoochee Rivers, rises gradually from an elevation of about 120 feet at the State line to about 460 feet along the northern divide. Slopes here are generally steeper than in the other parts of the basin. Diversified agriculture is carried on throughout the area.

Okefenokee Swamp lies on the easterly side of the basin. It is fed by several small streams and totals about 1,100 square miles. The Suwannee River drains about 800 square miles of the swamp, and the St. Marys River drains the remainder. The swamp varies in elevation from 100 to 120 feet above mean sea level, in the Lower Coastal Plain. A low dam, or sill, on the Suwannee River at the swamp outlet controls the water level in most of the swamp to about elevation 115.

Extending from the Florida State line and Okefenokee Swamp flatlands southward to the Gulf of Mexico is the area, largely in the Upper Coastal Plain, drained by the Suwannee and Santa Fe Rivers. It is characterized generally by less relief, lower elevations, and fewer tributary streams than the rolling lands of Georgia. Sinks, lakes, and underground limestone solution channels of this region store and regulate much of the runoff before it collects in surface channels. About 25 miles upstream from the Gulf of Mexico, the Suwannee River valley widens and merges into the low, flat plain bordering the coast.

Rivers

The Suwannee and its three large tributaries, the Alapaha, Withlacoochee, and Santa Fe Rivers, are similar. Their channels are 15 to 30

Figure 1.3 *Upper Coastal Plain.*

Figure 1.4 *Okefenokee Swamp, "Land of the Trembling Earth."*

Figure 1.5 *Lower Coastal Plain Where Cultivated Areas Are Interspersed in Timberland.*

feet deep and often cut through the shallow earth overburden well into limestone. The narrow valleys are usually wooded and contain marshes or cypress sloughs. The rises from the valleys to the upland are low but abrupt.

Numerous channels converge at the southwest corner of Okefenokee Swamp near Fargo, Georgia, to form the Suwannee River. It flows southerly 45 miles to White Springs and then forms a wide loop toward the west, picking up, in turn, its principal tributaries, the Alapaha, Withlacoochee, and Santa Fe Rivers. Continuing on southward, the Suwannee empties into the Gulf of Mexico through two passes about 12 miles north of Cedar Key, Florida.

The Alapaha River rises in the northernmost portion of the basin near elevation 460 and flows generally south-southeasterly about 134 miles to its confluence with the Suwannee River, some 7 miles upstream from Ellaville, Florida. During normal and low-flow periods, the stream goes underground about 10 miles above its mouth and emerges in a large, dark-colored spring in the Suwannee River a short distance above the confluence of the overland channels.

Figure 1.6 *Little River, a Typical Suwannee Basin Tributary Stream.*

Tributaries of the Withlacoochee River rise at about elevation 450 feet along the basin divide southwest of the Alapaha River headwaters. The main Withlacoochee River rises near Tifton, Georgia, and flows south-southeasterly 86 miles to join the Suwannee River at Ellaville. Numerous small tributary streams drain its rolling watershed. Runoff distances to the streams are short.

The source of the Santa Fe River is Lake Santa Fe, near the southeastern margin of the basin, at elevation 135 feet. The river flows westerly 60 miles to join the Suwannee River some 66 miles above its mouth. About 9 miles upstream from High Springs, Florida, the Santa Fe River goes underground through a sink. It reappears 3½ miles downstream. The underground channel is just below the ground surface, and the roof has caved in at several places along its course. During high stages, the water flows overland in this reach.

Swamp

The Okefenokee or "Land of the Trembling Earth" was so named by the Seminole Indians because of the unstable nature of its soil. The swamp is one of the largest fresh-water swamplands in the United States and by far the most significant inland body of water in the Suwannee basin.

The Okefenokee area is a geological phenomenon in which a biological and ecological oddity has evolved that has no counterpart. It is believed that the area was once a cup in the ocean floor. The receding ocean and subsequent erosion around the dome on which the swamp lies have left a comparatively watertight saucer. This has resulted in a perched water table and an ideal environment for the aquatic and semi-aquatic plant and animal life that abound in the area.

About two-thirds of the swamp, including 331,000 acres in Suwannee basin, have been set aside as a wildlife refuge administered by State and Federal agencies for wildlife preservation, recreational use, and to maintain its unique beauty and ecology.

Coast

Short stretches of tidal marsh along the Gulf of Mexico adjacent to the river mouth are the only direct exposures to salt water. These tidal marshes provide good fish and wildlife habitat, but lack attractive beaches for shore recreation or related uses. There is a sand beach on Seahorse Key, an island in the Gulf about 15 miles south of the mouth of the Suwannee River, but it is relatively inaccessible.

The Gulf is very shallow out to the Suwannee reef, which lies from 1 to 5 miles offshore. Commercial shipping and boating on the Suwannee River is hampered by these offshore conditions.

Geology

Beneath the Florida peninsula and southern Georgia are a series of marine sediments, about 4,000 feet thick, resting on a base of crystalline rock. Perhaps the most significant of these beds is the soft, highly fossiliferous Ocala limestone of Eocene age which bulges upward above sea level in a long oval dome beneath the drainage basin of the Suwannee River. The crest of the dome nears or breaches the surface of the ground in the vicinity of Ocala, Florida, to the south of the Suwannee basin, at an elevation of less than 100 feet. From the crest, the upper surface of the Ocala limestone slopes downward in all directions and nears sea level under the Suwannee River between White Springs and Branford. The slope continues downward toward the north and northwest under southern Georgia to about 250 feet below mean sea level. It then rises again to appear at the surface along the upper reaches of the Ocmulgee and Flint Rivers outside the Suwannee basin.

The Ocala limestone slopes are overlain by a number of more recent deposits. These extend up the sides of the dome to various heights.

The exposure of the Hawthorn formation around the edge of Okefenokee Swamp indicates that it is continuous under the entire swamp area. Because the Hawthorn formation consists largely of impervious clays, marls, and cemented sands, its presence explains the existence of the swamp at such an elevation.

Most of the limestones, particularly the Ocala, are permeable to and soluble in water percolating from the surface. As a result, they are honeycombed with solution channels, many of considerable size. These limestones are near the surface in an area extending northward from the lower 20 miles of Santa Fe River to about the Florida-Georgia State line above the mouths of the Withlacoochee and Alapaha Rivers and upstream along the Suwannee River to White Springs. Consequently, the area is characterized by numerous springs, sinks, caverns, and underground passages. Many small streams end in sinks, and much of the surface drainage in the area collects in ponds or small lakes which have no visible outlets. In these sinks the water finds its way into the underlying limestone by percolation and seepage. Among the most conspicuous of the many sinks are those into which the Alapaha and Santa Fe Rivers disappear.

Figure 1.7 *Suwannee Coast. Marshes Are Dissected by Shallow Brackish Streams.*

The basin geology creates an engineering problem. It stems from the fact that water moves through the limestone in unknown quantities and directions. Where the cavernous formation is at or near the surface, control of water on the surface becomes almost impossible. In other

Figure 1.8 *Disappearing Stream near Valdosta.*

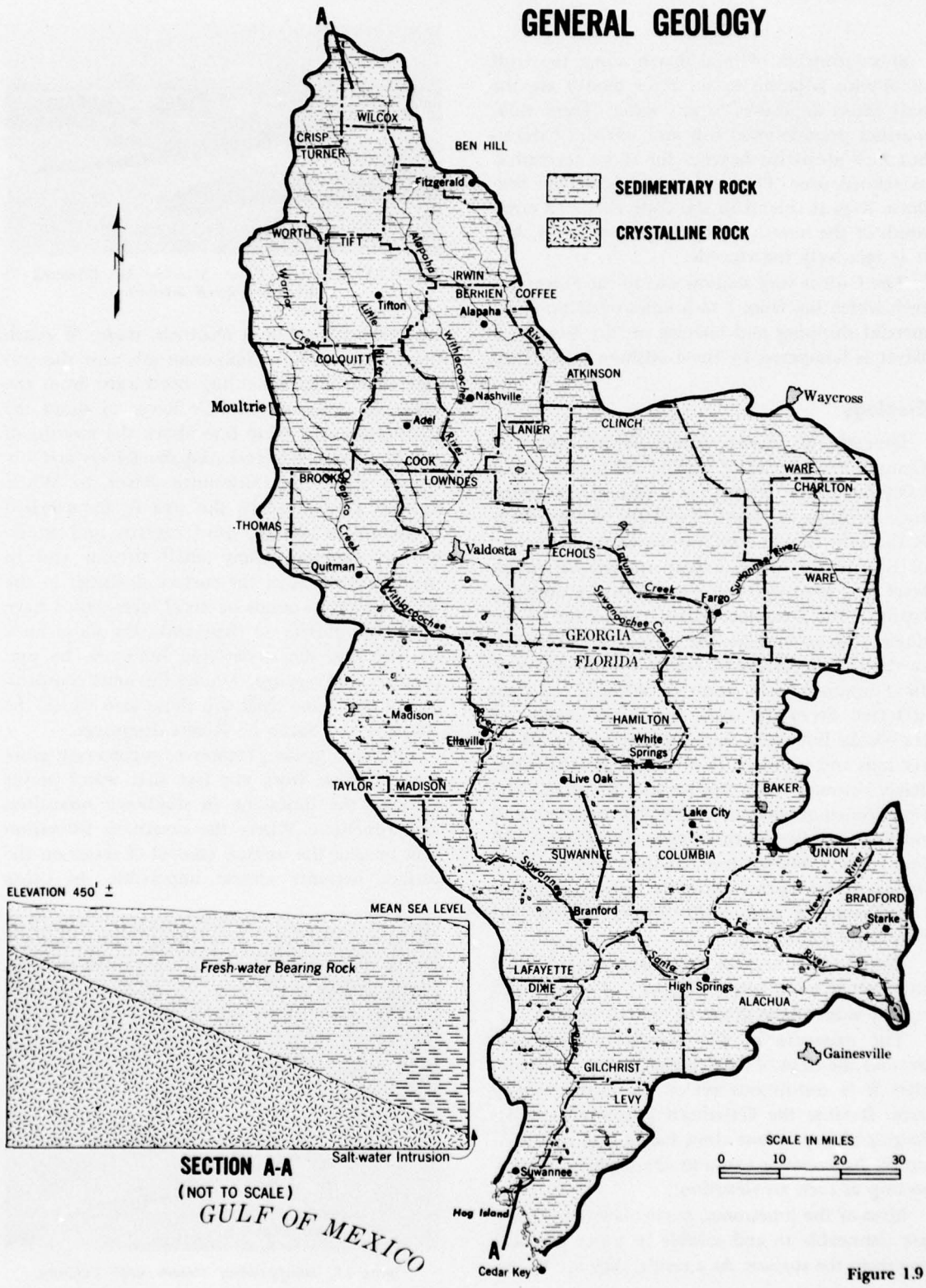

GENERAL GEOLOGY
SEDIMENTARY ROCK
CRYSTALLINE ROCK
A
A
WILCOX
CRISP
TURNER
BEN HILL
Fitzgerald
WORTH
TIFT
IRWIN
BERRIEN
COFFEE
Tifton
Alapaha
Alapaha River
Withlacoochee River
Warrior Creek
Little River
COLQUITT
ATKINSON
Nashville
Moultrie
Adel
LANIER
CLINCH
Waycross
COOK
LOWNDES
WARE
CHARLTON
BROOKS
Okapilco Creek
THOMAS
Valdosta
ECHOLS
Quitman
Withlacoochee
Alapaha River
Suwannee River
Fargo
Okapilco Creek
Swamp Creek
GEORGIA
FLORIDA
Madison
Ellaville
Suwannee River
HAMILTON
White Springs
TAYLOR
MADISON
Live Oak
BAKER
Lake City
SUWANNEE
COLUMBIA
UNION
Suwannee River
Branford
New River
BRADFORD
Starke
Santa Fe River
LAFAYETTE
DIXIE
High Springs
ALACHUA
Santa Fe River
Gainesville
GILCHRIST
LEVY
SCALE IN MILES
0 10 20 30
Suwannee
Hog Island
Cedar Key
GULF OF MEXICO
ELEVATION 450' ±
MEAN SEA LEVEL
Fresh-water Bearing Rock
Salt-water Intrusion
SECTION A-A
(NOT TO SCALE)

Figure 1.9

areas, it is extremely difficult to predict the influence that the formations might have on surface water control.

Soils

The Coastal Plain soils are derived primarily from unconsolidated, stratified, marine sediments. The texture of the soils varies widely, ranging from sands to clays. Some soils have moderate to rapid internal drainage and some, notably those of the low-lying swampy areas and tidal marshes, have slow internal drainage.

Nearly all of the farmland in the basin is in the Upper Coastal Plain. The soils are predominantly of moderately fine texture and are easy to manage, except for rather severe wind and water erosion tendencies in some areas. The soils have inherently low fertility but respond well to fertilizer.

In the Lower Coastal Plain, or flatwoods, soils are generally sandy; but some areas contain much material, principally clay, that inhibits infiltration and percolation. A large percentage of these soils is poorly drained. They produce abundant vegetation, but they are difficult to manage, even when dry. Consequently, the land is used primarily for timber and pasture. Vegetables are produced on a small scale in some areas.

Climate

The basin has long, warm summers and short, mild winters. There are few sunless days. Rain generally occurs in brief storms and is well distributed over the basin. Snow is extremely rare.

Average annual temperatures range from 65° Fahrenheit in the upper basin to 72° in the south. Extremes of 5° and 106° have been recorded. The frost-free season varies from 250 days in the interior to 300 days along the coast. Sunshine ranges from 53 percent of the daylight hours in December to 68 percent in May. Prevailing winds are light with no pronounced directional pattern. Relative humidity is typically less than 60 percent during the warmest part of the day.

The range and distribution of temperatures and precipitation at Waycross, Georgia, are representative of the basin and are shown on the accompanying charts.

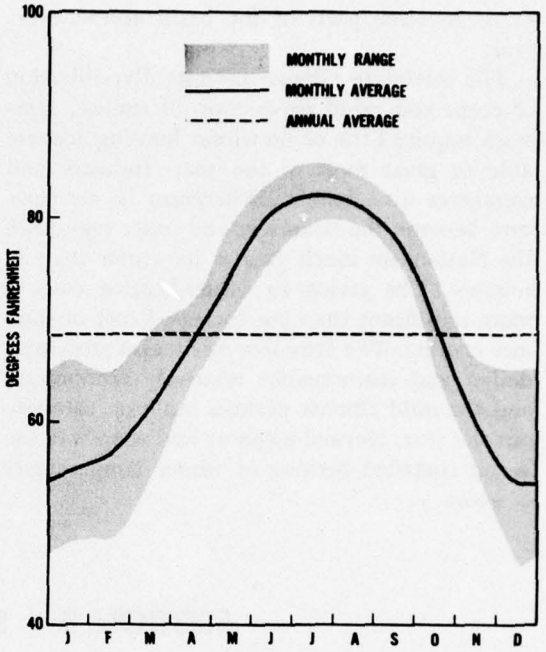


Figure 1.10 *Temperatures at Waycross, Georgia, 1926-1955.*

Average yearly rainfall ranges from 44 inches in the upper basin to 52 inches along the coast. Much of the rain comes from thunderstorms, although hurricanes have produced highest daily totals. A maximum 24-hour rainfall of 30 inches occurred at Trenton, Florida, in October 1947. Severe droughts such as the one that occurred in 1954-56 are uncommon, but moisture deficiencies

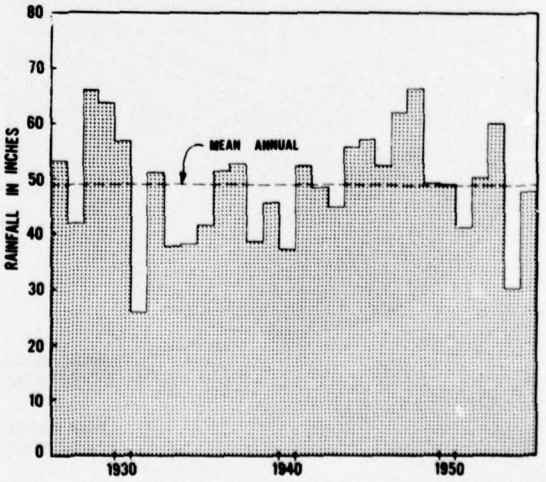


Figure 1.11 *Annual Precipitation at Waycross, Georgia.*

occur in some parts of the basin almost every year.

The moderate climate permits diversification of crops and rapid production of timber. Livestock require little or no winter housing and are able to graze most of the year. Industry and commerce also benefit. Differences in temperature between the Southeast and other regions of the Nation are much greater in winter than in summer. The saving in winter-heating costs is more significant than the increased cost of summer cooling. The frost-free soil makes structural design and maintenance relatively economical, and the mild climate permits building throughout the year. Normal highway and waterway use is not curtailed because of winter temperatures or snow.

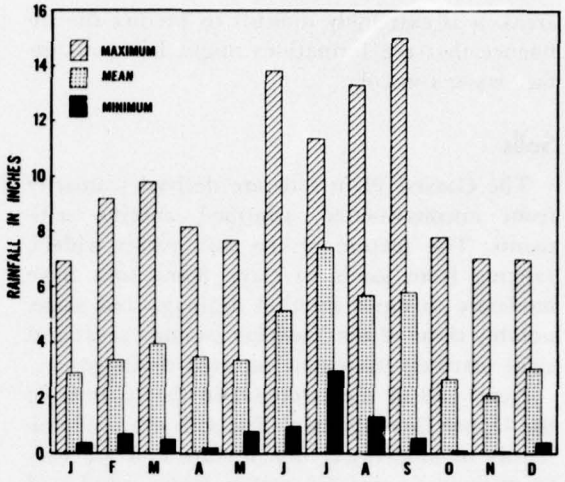


Figure 1.12 *Monthly Precipitation at Waycross, Georgia.*

SECTION II – BASIN RESOURCES

Land

The Suwannee basin encompasses some 7 million acres. This amounts to 24 acres for each person residing in the area in 1960. About 6.3 million acres are used for agriculture, including cropland, pasture, woodland, farmsteads, and farm roads. Another 600,000 acres are used for services, including urban areas, transportation facilities, and parks. About 100,000 acres are covered with water in reservoirs, ponds, and streams.

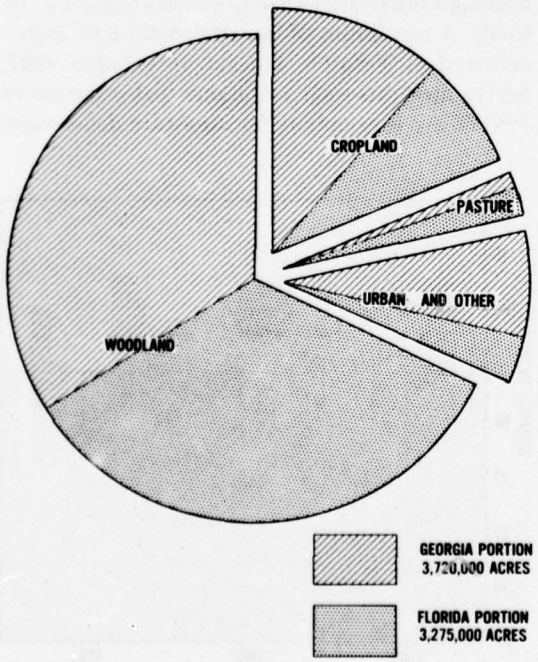


Figure 1.13 *Land Use in 1959.*

More than two-thirds of the basin is forested. More than half of the forest is pine, and one-fourth is bottom land hardwoods. Pure upland hardwood stands and hardwoods mixed with occasional pines are scattered throughout the basin. About 119,000 acres of the basin forest land are in the Osceola National Forest, northeast of Lake City, Florida.

About 1.6 million acres in the basin are currently used for production of food and nonwood fiber, although nearly 4 million acres are suitable for cultivated crops. While land-use shifts by the year 2000 may involve comparatively large numbers of acres, they are not expected to be a significant percentage of the basin area.

About 150,000 acres in the basin area are devoted to transportation. The basin is now served by a good system of county and State roads and by a 965-mile network of railroads that connects with lines to all parts of the Nation. Major national highways and two transcontinental routes of the interstate highway system intersect within

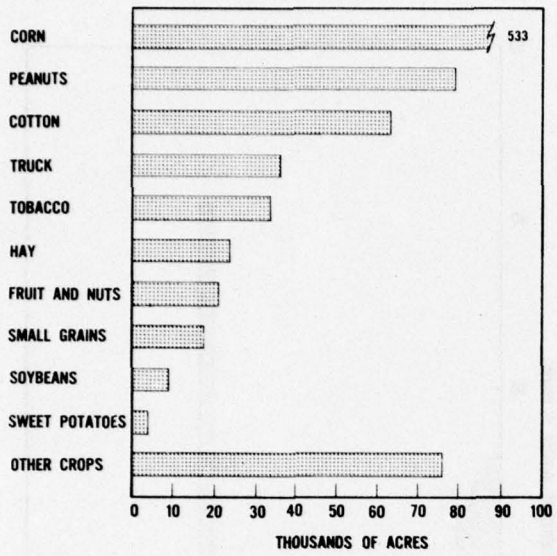


Figure 1.14 *Cropland Harvested—1959.*

the basin. Air service is available at Valdosta, Georgia, in the basin, and at Jacksonville, Gainesville, and Tallahassee, Florida, near the basin boundaries.

Recreation represents an important segment of the Suwannee basin economy even though less than one-tenth of 1 percent of the land is devoted to recreation developments. There are no national parks in the basin although Okefenokee National Wildlife Refuge has many of the characteristics of a national park. Georgia has one 13-acre State park in the basin. There are about 5,300 acres reserved for recreation in the Florida portion, but less than 20 percent of the reservation has been developed for intensive use. The Osceola National Forest provides an extensive recreational opportunity. There are numerous local and private recreation developments, but these are designed primarily to serve local needs. Because the basin abounds in naturally scenic springs, streams, and forest areas, little artificial development has been needed.

Figure 1.15 *Stephen Foster Memorial near White Springs.*

Okefenokee Swamp provides an environment that cannot be duplicated artificially. Aside from the question of whether such unique areas should be preserved for their esthetic values, consideration of the future economic values of the 331,000-acre swamp reservation indicates that it is more valuable as a "natural" fishing and sightseeing area than for any other conceivable use.

About 100,000 acres within the basin are used for mining, rural industry, urban areas, and other services.

Water

The Suwannee basin has a generous supply of good quality water from both ground water and surface sources. The permeable limestone which underlies the Coastal Plain is the major source of water for deep wells in the basin. Layers of sand, gravel, and clay between the ground surface and this permeable limestone provide water for shallow wells.

The water-bearing formations vary in thickness from a few to several hundred feet. In the area underlain by the principal artesian aquifer the depth to water varies from zero to nearly 500 feet. There are many large springs and wells in the aquifer which yield several thousand gallons per minute. The principal aquifer is recharged in an extensive zone which crosses the northern extremity of the basin, in small areas near Valdosta, and along the southeast margin of the basin.

Total streamflow varies greatly from year to year and within a year. Streams in the basin are typically high in the early spring. In summer, the flows of many streams recede and remain relatively low through autumn. Other streams have a secondary autumn peak.

During drought periods, the major part of

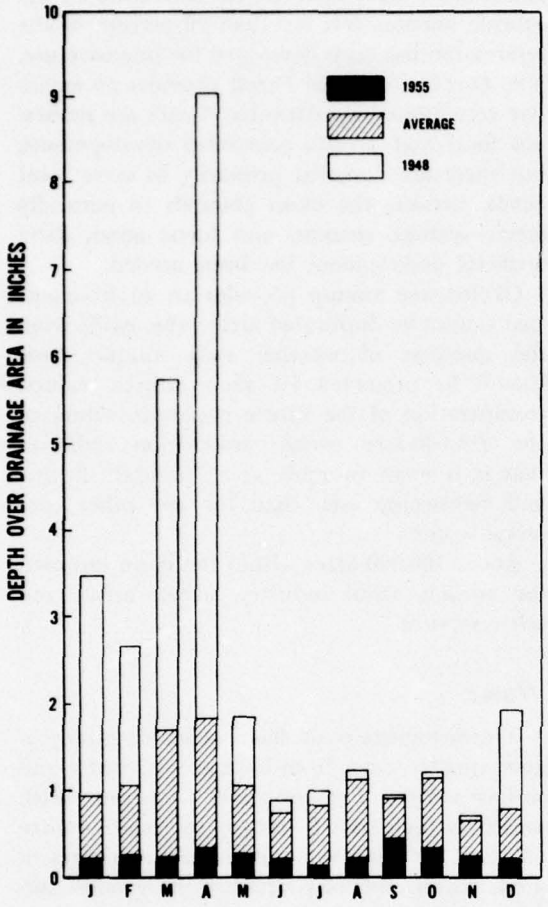


Figure 1.16 *Monthly Runoff, Suwannee River near Ellaville, Florida.*

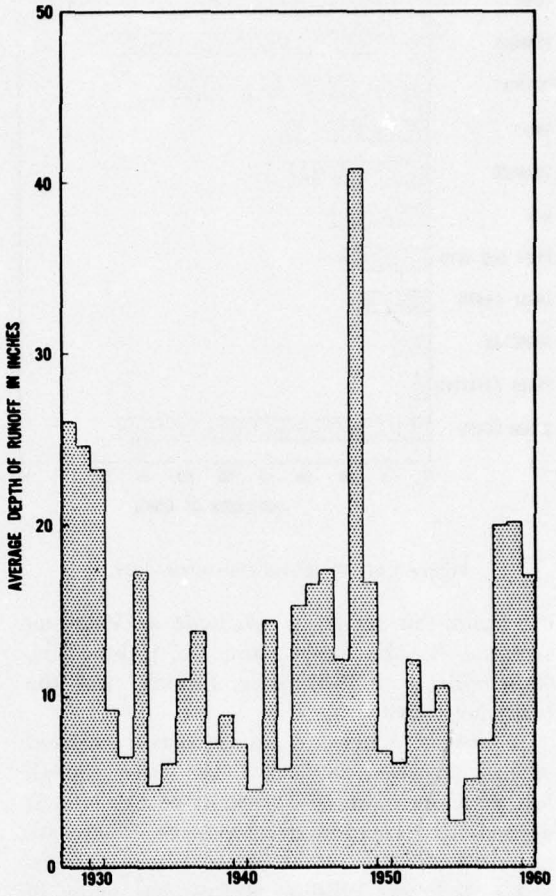


Figure 1.17 *Annual Runoff, Suwannee River near Ellaville, Florida.*

the flow of the Suwannee River at the mouth originates in the limestone areas where springs feed the streams. During periods of normal flow, the sources of water are fairly well distributed throughout the drainage basin. During most flood periods, the major portion of the flow comes from the northern tributaries. Some springs in the lower part of the basin actually run backwards during flood stages, accepting floodwater into the underground reservoir. Thus, the area where surface water control would be the most beneficial is in the northern tributaries.

Average annual runoff at the Suwannee River mouth is about 14 inches. This is much more than the United States average and slightly less than that of the Southeast as a whole. Runoff at Ellaville, where variations from the average are typical of most of the basin, is depicted graphically on the accompanying figures.

The chemical composition of the basin surface water compares favorably with water available elsewhere. The basin average is 150 parts per million of total dissolved solids in a range of 25 to 500 parts per million. The average for the United States is 300 parts per million. The concentration of dissolved solids in the Suwannee is largely a result of surface flows being mixed with ground waters flowing from areas of soluble rock. Hardness increases progressively downstream, but most areas are within the limits of moderately soft water.

The sediment load in the Suwannee basin is not a serious problem. Concentrations of 5 to 50 parts per million occur. The sediment load

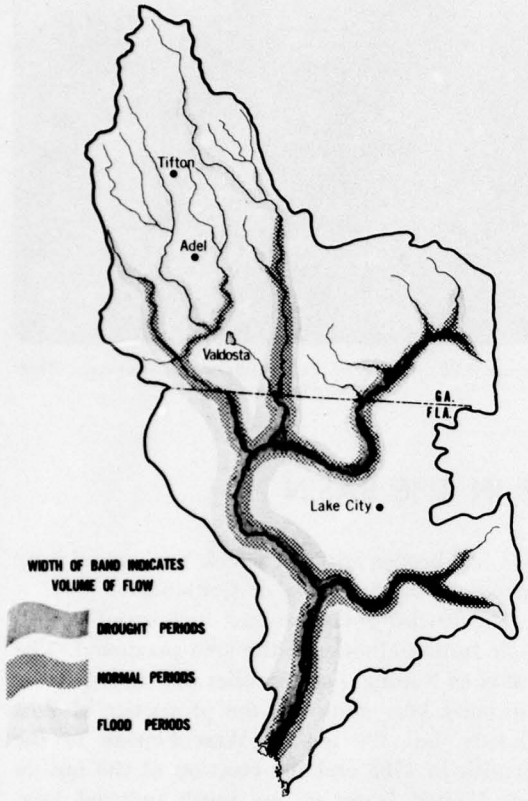


Figure 1.18 *Relative Amounts of Streamflow.*

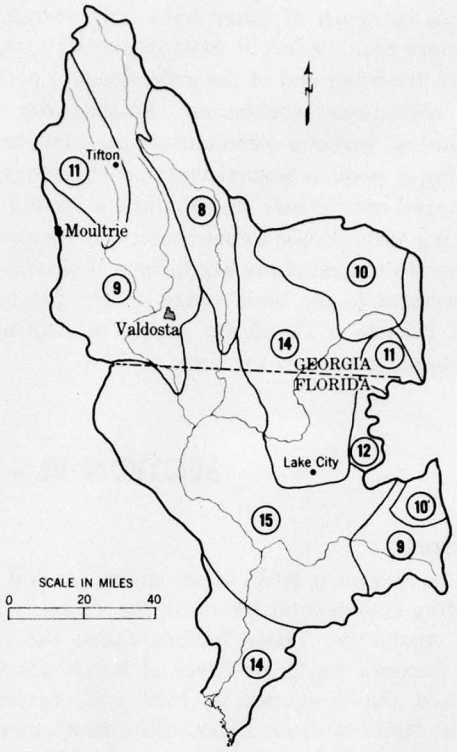


Figure 1.19 *Average Annual Runoff Contribution in Inches.*

increases with increased flows. Approximately 90 percent of the load is carried by flows occurring 10 percent of the time.

Water temperature is an important factor in recreation, industrial cooling, fishing, and other activities. The water temperature in the larger streams of the basin varies from 50° Fahrenheit in winter to 80° in summer, and the smaller streams have an even greater range and a more rapid fluctuation. The ground water temperature, at 60-foot or greater depths, ranges from 65° to 70° with little variation during the season and from year to year.

Suwannee River water is used for condenser cooling at a steam powerplant near Ellaville, Florida. This and fishing and recreation are the only major surface water uses where temperature is an important factor.

Pollution is not a serious problem in the basin, but some sewage treatment facilities were inadequate in 1960, and most of them lacked reserve capacity for expected urban and industrial growth. Much of the surface water in the basin contains high concentrations of organic matter. This gives the water a dark color but does not affect its usefulness for human consumption.

Tidal effects from the Gulf of Mexico extend upstream about 15 miles from the mouth of the Suwannee. The salt-water wedge extends nearly as far, depending on the flow of the stream. Salt-water intrusion is not a significant problem.

In the southern part of the basin, streamflow is influenced greatly by the large springs and limestone sink conditions in which streamflow and ground water are practically indistinguishable. Short-term fluctuations of flow in much of the basin are smoothed out by this vast ground water storage and by the enormous storage in Okefenokee Swamp.

Seldom does more than half of the water in a rainstorm appear in the flood rise resulting from the storm. In spite of the regulating effect

of natural storage in the basin, however, the variations in depth of water have ranged from 15 to more than 30 feet at most gaging stations.

On the other end of the scale, drought periods are sometimes troublesome. Streams dry up; pollution becomes pronounced in some areas; fishing is poor or nonexistent; boats have to be portaged over shoals; and shallow wells dry up, forcing some people to haul their water supplies. Control of streamflows would be a desirable improvement in the basin today. In the future, it will become a significant factor in continued economic growth of the area.

Figure 1.20 *Timbered Areas Border the Suwannee River Throughout Its Length.*

SECTION III – PEOPLE IN THE BASIN

History

The Suwannee River at one time separated two leading Indian confederations, the Timucua and the Apalachee. These Indians called the river the Guasaca Esqui, or River of Reeds. De Soto crossed the Suwannee in 1539 and christened it the River of Deer. Later, white men renamed the river the Little St. Johns or San Juanee to distinguish it from the larger St. Johns to the east. The name Suwannee resulted from colloquial pronunciation of San Juanee.

In the 16th century, King Philip of Spain commissioned Pedro Menendez de Aviles to fortify the Florida coast and convert the Indians to Christianity. There were once five Spanish missions in the Suwannee basin, but the exact sites of some of them are no longer known. The priests who lived in the missions instructed the Indians in Christian doctrine and taught them to herd cattle and improve their crops. The Indian villages of the day presented a remarkable picture of civilized community life.

This civilization was rudely interrupted at the beginning of the 18th century. The Creek Indians of north and central Georgia sided with the English against the Spanish, and in 1702 began a series of raids into the Suwannee area. By 1706 the towns and missions of the Spanish trail were almost deserted; and the English colonists, who replaced the Spanish, found their Creek allies firmly established and organized in a strong confederation. Members of this confederation had broken with the Creek Nation and were known as the Seminole or Outlanders.

The British governors had little trouble with their Indian allies, and the area prospered. The influx of leading Tory families during the Revolutionary War added to the prosperity of East Florida, but the loss of West Florida to the Spanish in 1783 and the creation of the hostile new United States to the north induced England to cede the territory back to Spain. The English settlers fled to the West Indies, and Spain attempted to resettle the plantations with people from the United States. The Spanish subsequently sold Florida to the United States for $5 million. Payment was made in the form of damage settlements to American settlers who were demanding restitution from Spain.

Indian affairs furnished the most serious problem of the new territory. The Seminole ranks

Figure 1.21 *Cargo Steamer Madison, Sunk in 1864, Clearly Visible Under 6 Feet of Water in Troy Springs.*

were greatly enlarged by fugitive slaves during Spanish possession; and when the area became part of the United States, pressure was brought by the white settlers to remove the Indians to the south. Although a removal treaty was signed, attempts to enforce it precipitated a 7-year struggle involving great losses of life and property. The majority of the Seminoles was eventually transported west where they became a part of the five civilized tribes of Oklahoma. A small group had gone to the Everglades of southern Florida where their descendants still reside.

Once the Indian problem was settled, typical southern agriculture spread throughout the basin. Large plantations were established where cotton, sugar cane, tobacco, and hogs and cattle were raised. Quantities of naval stores and timber were shipped from the basin via the Suwannee River.

The Civil War disrupted the plantation living. While no decisive battles were fought in the area, the most sanguinary conflict fought in Florida occurred in the basin at Olustee, about 15 miles east of Lake City, where Confederate troops routed 12 regiments of Federal troops. The site is commemorated by the Olustee Battlefield State Memorial.

The Reconstruction Period was difficult. Recovery of the economy was encumbered with a military administration and the necessity to adopt a new way of life. By 1875, however, a semblance of order had been restored to the area economy. Commercial navigation on the Suwannee ended in 1900 as a result of railroad competition and low water, and the river again became the stream of legend and song. After 1900, agricultural shifts changed the character of many basin farms. Diversification of production created a more composite and somewhat self-sustaining agricultural picture. Industries developed and have helped to stabilize the area economy and make it less dependent on agriculture.

Population Development

The population of the Suwannee basin was 287,000 in 1960, an increase of about 6 percent over the 1930 population. This increase was small compared to the 34-percent increase for the Southeast River Basins and the 45-percent

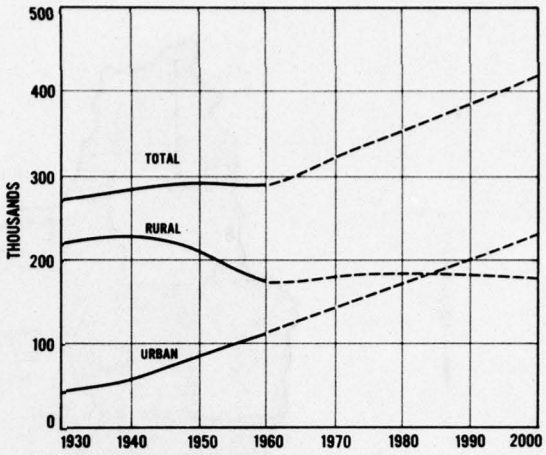


Figure 1.22. *Suwannee Basin Population — 1930-2000.*

increase for the United States. During the same period, the population of the State of Georgia increased about 35 percent, and the population of Florida more than tripled.

The Suwannee basin has been, and is still, largely a rural area. A large part of the rural population is concentrated in the northwestern part of the basin because of better agricultural opportunities. However, the rural farm population has declined rather drastically during the last 20 years. With the growth in rural nonfarm population, the total rural population of the basin is expected to increase slightly by 1975. Even with continued rapid growth, the urban population, which constituted only 40 percent of the total in 1960, is not expected to exceed the rural population until about 1980.

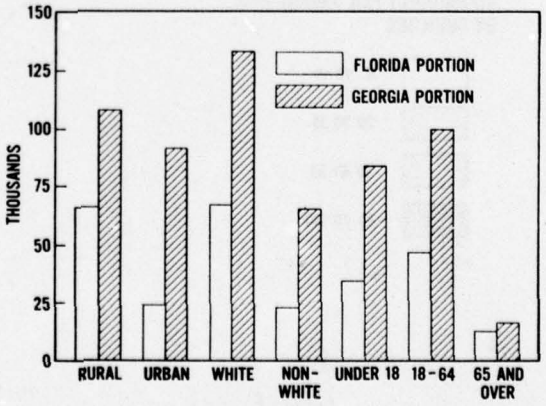


Figure 1.23 *Suwannee Basin Population Characteristics — 1960.*

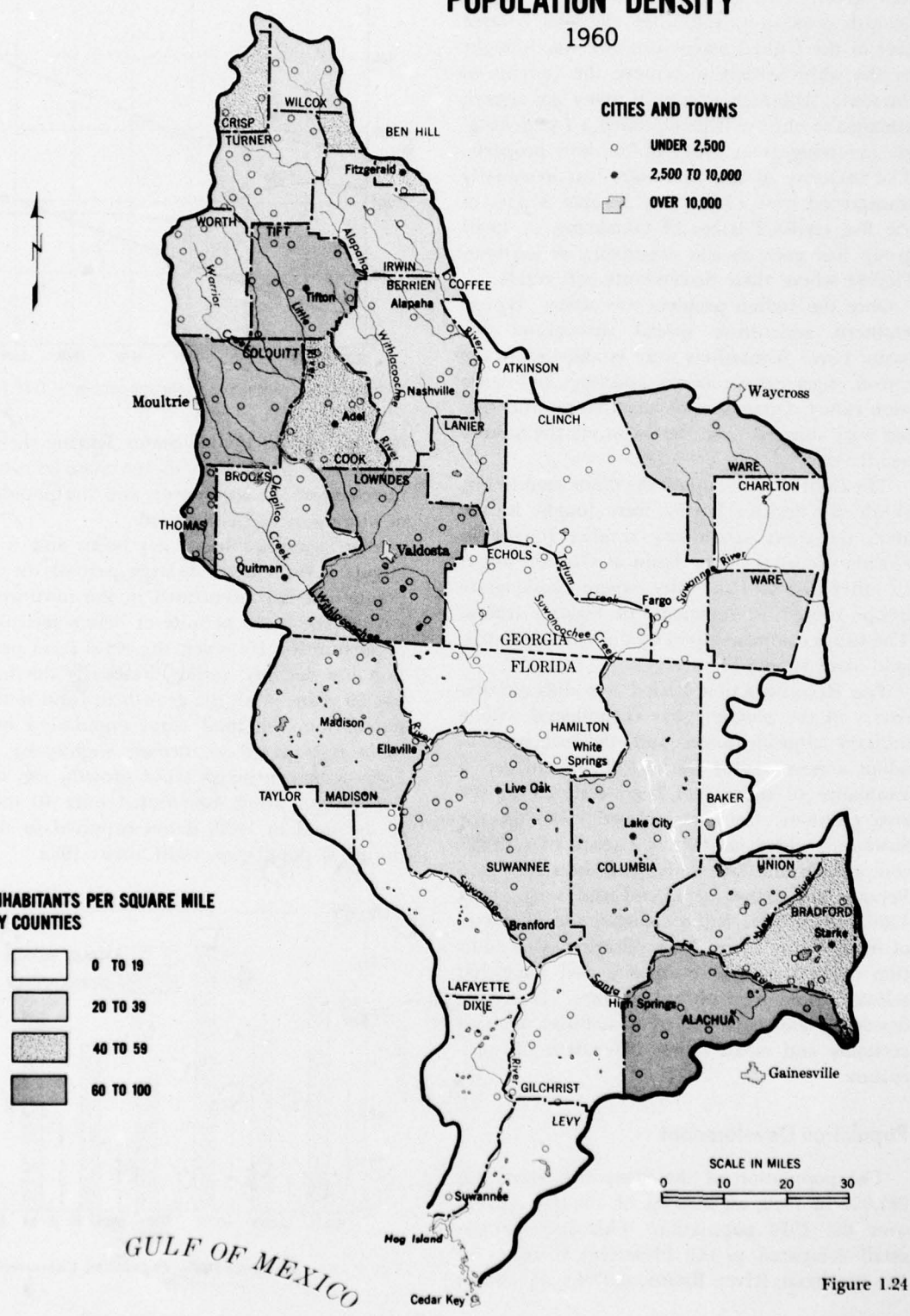

POPULATION DENSITY
1960
CITIES AND TOWNS
UNDER 2,500
2,500 TO 10,000
OVER 10,000
N
WILCOX
CRISP
TURNER
BEN HILL
Fitzgerald
WORTH
TIFT
Alapaha River
IRWIN
BERRIEN
COFFEE
Alapaha
Tifton
Warrior Creek
Little River
SOLQUITT
Withlacoochee River
ATKINSON
Nashville
Moultrie
Adel
LANIER
CLINCH
Waycross
COOK
BROOKS
LOWNDES
WARE
CHARLTON
THOMAS
Okapilco Creek
Valdosta
ECHOLS
Quitman
Withlacoochee River
Alapaha River
Suwannee River
WARE
Fargo
Suwanoochee Creek
GEORGIA
FLORIDA
Madison
Ellaville
Suwannee River
HAMILTON
White Springs
TAYLOR
MADISON
Live Oak
BAKER
Lake City
SUWANNEE
COLUMBIA
UNION
Suwannee River
BRADFORD
Starke
Branford
Santa Fe River
LAFAYETTE
DIXIE
High Springs
ALACHUA
Gainesville
Suwannee River
GILCHRIST
LEVY
INHABITANTS PER SQUARE MILE BY COUNTIES
0 TO 19
20 TO 39
40 TO 59
60 TO 100
SCALE IN MILES
0 10 20 30
Suwannee
Hog Island
GULF OF MEXICO
Cedar Key

Figure 1.24

Portions of the basin are located within the trading areas of Jacksonville, Gainesville, and Tallahassee, Florida, and Albany, Georgia. These cities are expected to grow rapidly and to have considerable influence on population growth and characteristics in the basin. All of the basin cities are expected to grow fairly rapidly during the next 40 years.

Population Characteristics

The basin population is 70 percent white. Native-born Negroes make up almost the entire nonwhite group. Although the basin has had a relatively high birth rate and low death rate, the resultant high natural increase has been significantly depleted by out-migration. Of those migrating, most have been young and middle-aged adults seeking employment opportunities. This combination of circumstances has resulted in a population having relatively high proportions of children and elderly persons.

Factors Affecting Population Change

To a large extent, the nature and characteristics of the present population of the Suwannee basin are a consequence of the social and economic forces of the past. Conversely, the future development of the economy will be directly influenced by the characteristics of today's population, as related to those of economically competitive areas.

The differences in population characteristics between the Suwannee basin and its competitive areas tended to decrease between 1950 and 1960. This trend should continue. However, these differences will continue to have an influence on future development in the basin for another decade or two. Indications are that the migration to the cities will leave large rural areas sparsely populated. Most rural losses will continue to be from the labor-force-age group. As a result, the greater proportions of the young and old impose a heavy economic burden on the productive few who must educate, train, govern, and sustain a relatively large number of people. The availability of capital for economic expansion is thereby restricted, thus compounding the economic problem.

Coupled with this is the problem of a large group of persons with a comparatively low educational level who cannot meet the high standards often required of workmen in modern industry. However, as economic development progresses, the basin will be in the position of having a relatively large number of young people maturing into the labor force. The area is making a concerted effort to prepare its young people for present and future employment needs. A trade school, recently established at Valdosta, and vocational courses offered at junior colleges at Lake City and Madison are examples of the effort being made to overcome the problems of the area. As adequate employment opportunities are provided and out-migration is reduced, the technically trained labor force now developing can give the area an important advantage for economic progress.

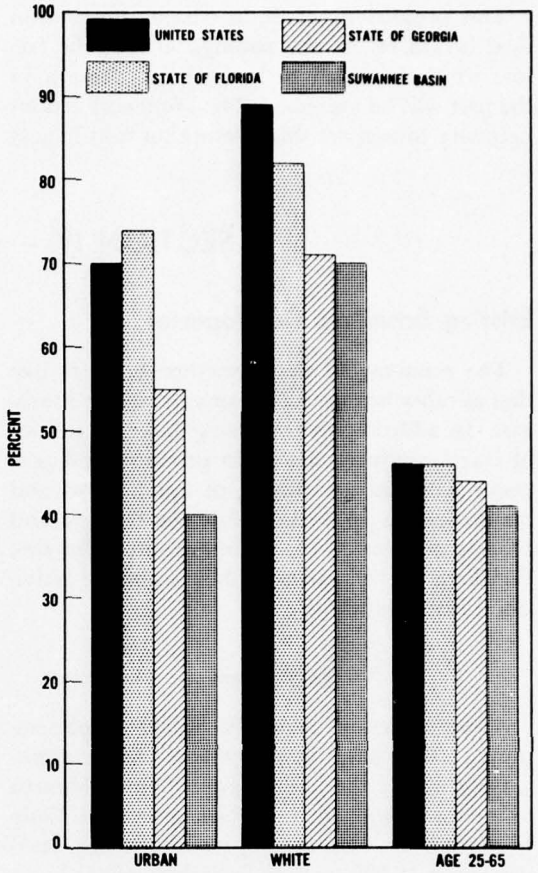


Figure 1.25 *Comparative Population Characteristics—Basin, States, and Nation—1960.*

The projections of future basin population used herein reflect the assumption that the factors which have led to heavy out-migration in the past will be overcome. The burden of actions necessary to support this assumption rests largely on local initiative. If the efforts are successful, by the year 2000 the Suwannee basin population should be growing at a rate in accord with, or above, the Southeast River Basins area and national levels.

SECTION IV – BASIN ECONOMY

Existing Economic Development

The economy of the Suwannee basin is like that of other nonmetropolitan areas of the Southeast. In addition to producing large quantities of forest products, the basin produces and processes a varied assortment of agricultural and manufactured products. While the Georgia and Florida portions of the basin are similar in size, the character and extent of their economic activities differ significantly.

Employment

About three-fourths of the 86,000 people employed in the basin in 1960 worked in the Georgia portion of the basin. More than one-fourth of the total employment was in agriculture. Only 16 percent was employed in manufacturing, leaving about 48,000, or well over half of all basin employment, in trade, services, and other activities.

Although agricultural activities are widely dispersed throughout the basin, both production and employment are most heavily concentrated in the northwestern portion. About two-thirds of all agricultural employment was in that area.

In the Georgia portion of the basin, the ten cities with populations in excess of 3,000 contain 80 percent of the manufacturing plants in that part of the basin. The five cities with population over 5,000 contain nearly two-thirds of the manufacturing plants.

In the Florida portion, the four cities with populations in excess of 3,000 people contained 60 percent of the manufacturing plants in 1960. The influence of these Florida cities on industrial development has, in general, been local in nature. Jacksonville to the east, Gainesville to the south, and Tallahassee to the west have influenced and will continue to influence the industrial activity in the southern part of the basin.

In 1960, there were about 420 manufacturing and processing plants in the 26 counties in the basin. One-fourth was in Florida and three-fourths in Georgia.

The 75 lumber and wood products enterprises constituted the most significant manufacturing group in the basin. These activities, like the heavily forested areas, are widely distributed throughout the basin, but the plant facilities are most heavily concentrated around the larger cities.

Other leading categories of manufacturing employment in the basin are apparel, metal, and food-product industries. Manufacturing activities of the apparel industries have been increasing in the basin, with some plants locating in small towns of the rural areas. The greater concentration of these activities, however, is also in or near the larger towns. The metal industries are among the fastest growing activities in the Southeast and the impact of the expansion is being felt in the Suwannee basin.

Trade, services, government, and construction activities are widely dispersed throughout the basin but are most heavily concentrated near the urban centers and major transportation routes, particularly in the Florida portion of the basin.

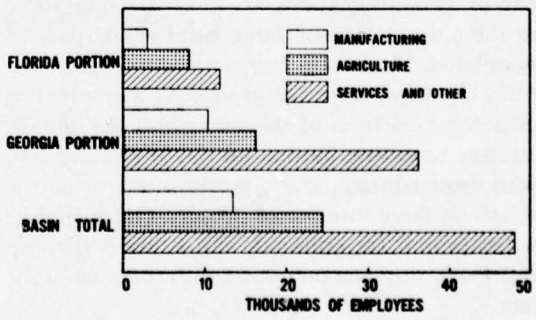


Figure 1.26 *Suwannee Basin Employment—1960.*

ECONOMIC ACTIVITY

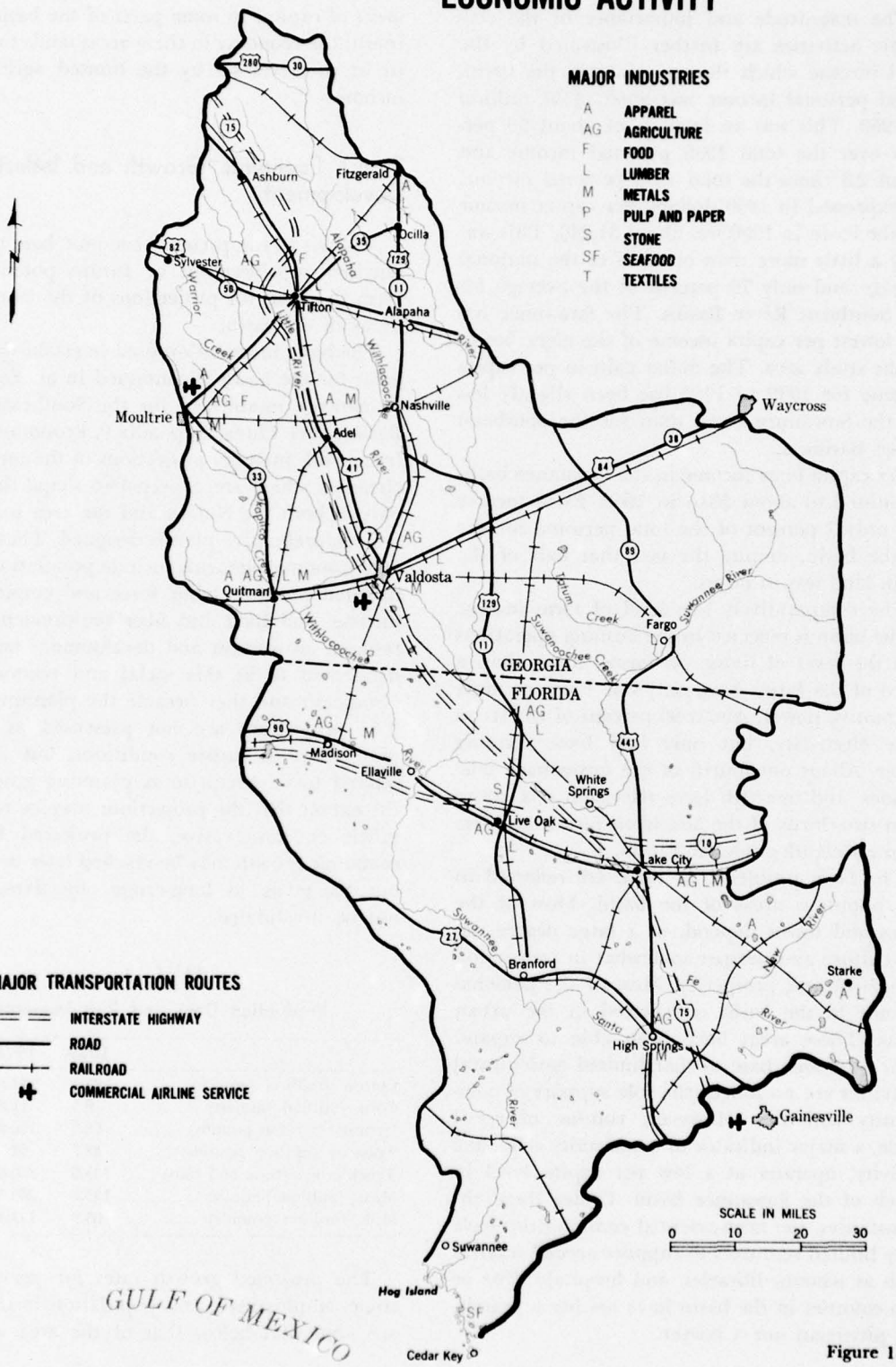


Figure 1.27

Income

The magnitude and importance of the economic activities are further illustrated by the total income which they generate in the basin. Total personal income was about $357 million in 1960. This was an increase of about 50 percent over the total 1950 personal income and about 2.5 times the total 1939 personal income, all expressed in 1960 dollars. Per capita income for the basin in 1960 was about $1,240. This was only a little more than one-half of the national average and only 79 percent of the average for the Southeast River Basins. The Suwannee has the lowest per capita income of the eight basins in the study area. The dollar gain in per capita income for 1939 to 1960 has been slightly less for the Suwannee basin than for the Southeast River Basins.

Per capita farm income in the Suwannee basin amounted to about $316 in 1960. Farm income was only 7 percent of the total personal income in the basin, despite the fact that half of the basin land was in farms.

The comparatively low level of farm income in the basin is reflected in the farming operations and the level of living on farms. More than a third of the farms have only one horse or mule for motive power. About 90 percent of the farms have electricity, but only half have running water. About one-fourth of the farms have telephones, and one-fifth have television sets. More than two-thirds of the adults on farms have less than an eighth-grade education.

The farm problems, in turn, are reflected in the populous areas of the basin. Most of the cities and towns depend, to a large degree, on agriculture and prosper somewhat in proportion to agricultural prosperity. Most of the personal income in the basin is centered in the urban areas. These areas have been able to expand their economic base so that limited agricultural activities are no longer the sole support of community activities. However, volume of retail trade, a major indicator of community economic activity, operates at a low per capita level in much of the Suwannee basin. Under these circumstances, the farm-oriented communities have only limited resources to support needed services such as schools, libraries, and hospitals. One or two counties in the basin have neither a practicing physician nor a lawyer.

These factors tend to discourage the investment of capital in some parts of the basin. As a result, the economy in these areas tends to be static at the level set by the limited agricultural income.

Future Economic Growth and Industrial Development

Analysis of the present economic base and the detailed consideration of future potentialities form the basis for projections of the future economy of the basin.

The basic information used in establishing the goals for the basin is contained in an Economic Framework established for the Southeast River Basins, Part Three, Appendix 9, Economics. This framework includes projections of the important elements which are expected to shape the economy of both the Nation and the area for which the comprehensive plan is designed. These social and economic elements include population, gross national product, labor force and employment, income, and food and fiber requirements. The resource utilization and development needs are delineated to fit this social and economic environment and they became the planning goals. The projections are not presented as precise predictions of future conditions, but are considered to be adequate as planning guides. To the extent that the projections may be too optimistic or conservative, the projected level of economic growth may be reached later or earlier, but the goals, as long-range objectives, would not be invalidated.

TABLE 1.1

Production Data and Requirements

	1959	1975	2000
Cotton (million pounds)	25.1	41.6	52.5
Corn (million bushels)	9.3	11.8	18.3
Peanuts (million pounds)	98.0	150.8	233.0
Tobacco (million pounds)	48.8	94.7	161.8
Truck crops (thousand tons)	135.0	360.0	606.0
Meat (million pounds)	143.8	265.5	429.8
Milk (million pounds)	105.8	177.3	239.2

The projected growth rates for personal income, employment, and population in the basin are somewhat below that of the area and Na-

tion. Nevertheless, an accelerated economic development is anticipated.

Keeping the economy moving at a reasonably uniform rate throughout the basin will not be easy, but it is not impossible. Local groups working on the problem are attempting to attract new industry into the basin and to capitalize on the tourist business engendered by the through routes crossing the basin. These approaches provide the more obvious means of augmenting economic activity, and they are important. However, they should not be considered cure-alls for the area ills. In the long run, it is the "quality of the product" that attracts the big investor. The Suwannee basin has the physical setting and the economic potential to develop a high level of economic activity. To do so, it must protect its abundant water supply, both as to quantity and quality; it must provide basic services to all of the people in the basin in an efficient manner; it must see that the labor force is educated and trained to a point where the workers will be able to cope with the exacting demands of tomorrow's business; and it must develop and at the same time protect from misuse or destruction its vast recreational potential.

After the national projections had been made and production requirements established, projections were made for the Southeast River Basins area and each of the river basins by subdividing the regional goals. Needs were determined in relation to these national, regional, and basin projections, physical resources, and the production requirements.

Increased use of fertilizer, herbicides, insecticides, and other aspects of improved farm management, particularly as they are used in combination, will have more effect on future production than will changes in land use. These factors will force some marginal farmland into other uses. In view of the current and projected potentials for agricultural production, land in the basin is underdeveloped and under-utilized in agriculture. Diverting some of it to uses that contribute more income and social satisfactions —recreation and fish and wildlife enhancement, for example—will be an economic advantage.

The trend of declining agricultural employment is expected to continue. A significant number of people from the rural farm population will be available for and dependent on nonagricultural employment. Although agricultural employment is expected to decline, agricultural production is expected to rise. By 1975, it is expected that farm production will have a gross value of $166 million and by 2000 about $254 million in 1960 dollar equivalents. Correspondingly, net farm income should increase to $78 million in 1975 and to $124 million by the year 2000.

As economic development proceeds, employment in service activities will increase more rapidly than the total employment. Such an increase will result from the needs of mechanization and other features for more highly developed economy and an increase in tourist trade.

Construction employment is expected to parallel expansion of the general economy.

Only modest increases are expected in mining employment, although there are substantial deposits of dolomite and phosphate in the basin that could be developed commercially.

Manufacturing is a prime factor in economic development. The future economy of the Suwannee basin will be determined to a considerable degree by the nature and growth of its manufacturing industries. Manufacturing employment is projected to increase 39 percent by 1975 and another 48 percent by 2000.

Attempting to recommend specific industries or specific locations for industrial development is beyond the scope of this Report. However, basic studies indicate that industries catering to recreation and tourism, such as boat building, camping equipment, toys, novelties, and allied business, should find a ready market for their products. Agriculture will need increasing amounts of fertilizers, pesticides, and other manufactured products. Processing of food and dairy products should become more important, particularly as farmers expand truck crop and livestock enterprises. In the heavier industries, plastics and molded plastic products show promise. Other potentials include the manufacture of cement, chemicals, metal products, electronics equipment, and wood products. All of these are well suited to the basin. Waste disposal is an important problem for many of these industries. While industry should, and will, provide proper primary and secondary treatment of plant wastes,

EMPLOYMENT

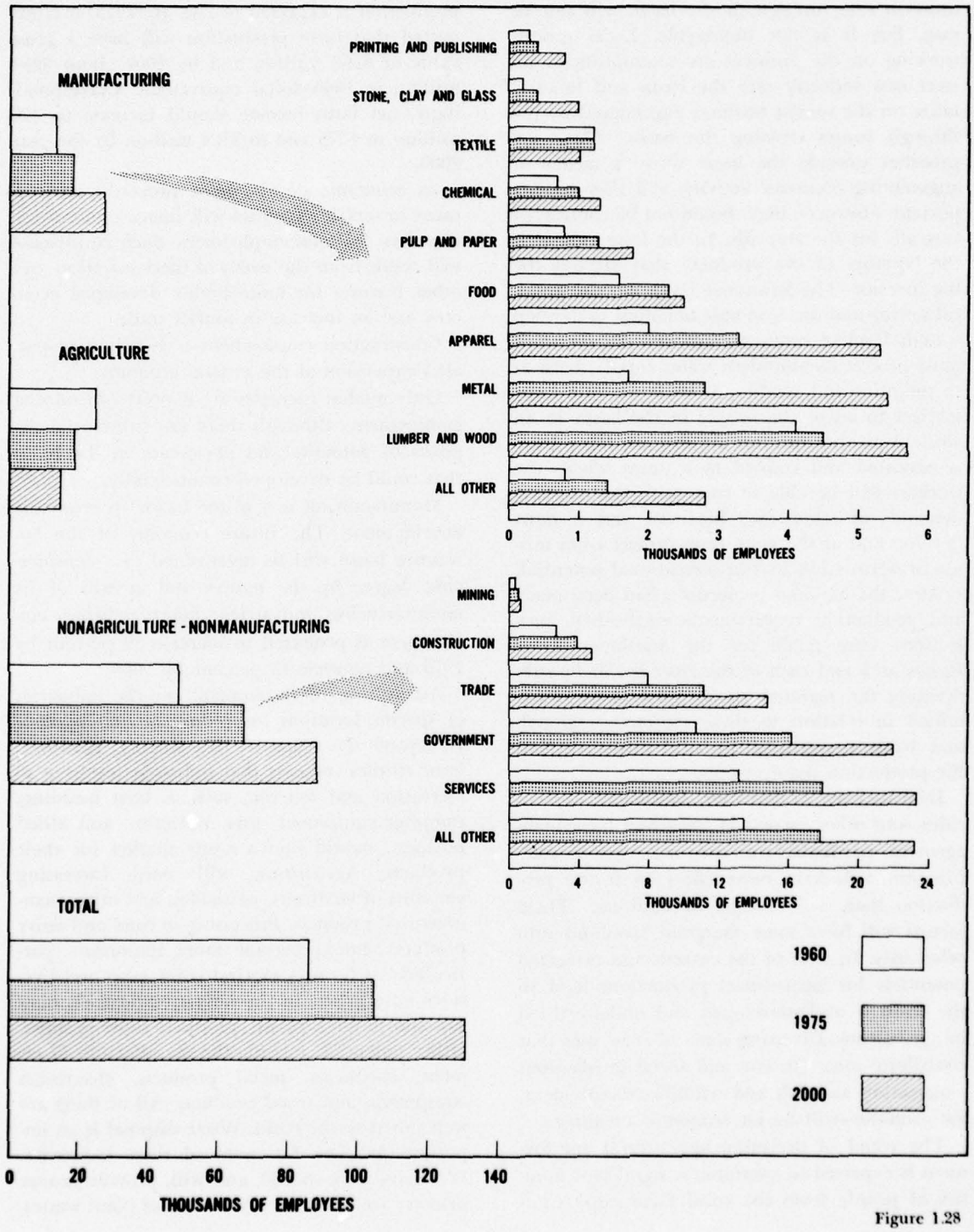


Figure 1.28

TABLE 1.2

Economic Factors and Projections

Year and area	Population (1,000)	Increase over 1960 (percent)	Employment (1,000)	Increase over 1960 (percent)	Per capita income*	Increase over 1960 (percent)
1960						
United States	180,000	----	67,000	----	$2,222	----
Southeast River Basins	4,948	----	1,753	----	1,582	----
Suwannee basin	287	----	86	----	1,243	----
1975						
United States	235,000	31	89,000	33	3,012	36
Southeast River Basins	6,408	30	2,343	34	2,202	39
Suwannee basin	338	18	105	22	1,673	35
2000						
United States	380,000	111	148,000	121	4,733	113
Southeast River Basins	10,050	103	3,789	116	3,922	148
Suwannee basin	408	42	131	52	2,904	134

* 1960 dollar equivalent.

it is essential that dilution water be available on a year-round basis for adequate dilution of treatment-plant effluents.

The lumber and wood products industries now represent 31 percent of the industrial employment. While the wood products industries recently showed some decline in employment as a result of modernization and mechanization, there was no decline in overall output; and the vast expanse of timber resources in the basin is expected to sustain growth in these industries. The number of employees engaged in lumber and wood products industries is expected to increase about 40 percent by 2000. Production will expand even more rapidly.

Employment in the apparel industries increased 40 percent between 1947 and 1954 and is expected to more than double in the next 40 years. Substantial increases in employment for these industries are based on their adaptability to rural areas and the growing popularity of the informal lines of apparel manufactured for expanding local and national markets. Employment gains in these industries are expected from expansion of existing facilities and the installation of new plants in both rural and urban areas.

In terms of employment, the metal industries are the most important in the economy of the United States. In the Southeast and in the Southeast River Basins study area, metalworking is the third largest industry. More than 12 percent of the personnel employed in manufacturing in the Suwannee basin are engaged in metalworking. With an ample labor force available and

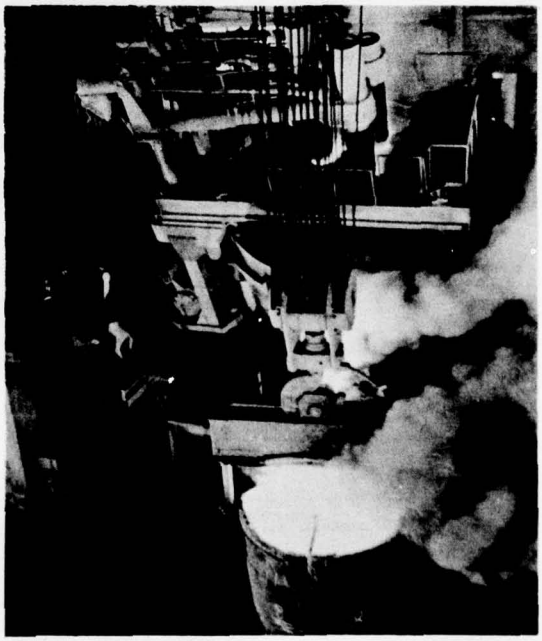


Figure 1.29 *Metals Plant. This Type of Industry Is Expected to Develop in the Suwannee Basin.*

with urban markets continuing to grow, employment in these industries is expected to increase to almost 20 percent of the total manufacturing employment by 2000. The greatest gains in this category are likely to be in or near the larger urban centers of the basin.

The food-product industries have been growing rapidly throughout the Southeast and have exceeded the national growth average. In the future, the Southeast and the Suwannee basin should continue to play an important role in satisfying national needs for processed foods. Technology in the food industries will very likely result in plant enlargement and increased output per employee. Nevertheless, employment projections for these industries reflect an upward trend. In 1960, about 12 percent of manufacturing employees were in the food-product industries. An increase of about 900 employees is expected between 1960 and 2000. Expansion of existing facilities and the introduction of new plants and processes are anticipated throughout the basin, particularly in or adjacent to areas suitable to the production of raw materials.

In 1960, the basin textile industries accounted for 9 percent of the manufacturing employees. It is unlikely that these industries will hold their present position in the expanding economy of the area. By 1975, it is estimated that employment in textiles will be about 6.5 percent of the total; and by 2000, about 4 percent. In the past, the textile industries have required a large amount of low-skill labor, but with the increasing competition from synthetics and foreign supplies, there has been a marked trend toward consolidation and automation. This trend will probably continue and the percentage of the total manufacturing employment in the textile industries will gradually decrease.

TABLE I.3

Employment in Manufacturing, 1960, and Projections for 1975 and 2000

Industry	Number of employees		
	1960	1975	2000
Lumber and wood products	4,100	4,500	5,700
Apparel	2,000	3,300	5,300
Metal	1,700	2,800	5,400
Food	1,600	2,300	2,500
Textile	1,200	1,200	1,000
Pulp and paper	800	1,300	1,800
Chemical	700	1,000	1,300
Printing and publishing	300	400	800
Stone, clay, and glass	200	400	1,000
All other	800	1,400	2,800
Total	13,400	18,600	27,600

Growth in the pulp and paper and stone, clay, and glass industries is closely allied to the natural endowments of the area. The forest resources are already widely utilized, but the stone and related materials have been barely touched. Growth in chemical, printing and publishing, and miscellaneous industries is anticipated to follow general growth and development in the basin and the Southeast.

Tourism is already an important industry in the Suwannee basin. As the traveling public increases, as transportation facilities are improved, and as better recreation facilities are provided, tourism can be expected to become one of the most significant industries in the area.

Industrial development is essential to the basin as a means of providing new job opportunities for displaced farm workers, for the normal labor-force expansion, and for raising levels of employment income. For short-range planning to obtain immediate results, local resources should be examined and the possibilities for expansion under going programs determined.

The Small Business Administration, U. S. Department of Commerce, can make loans to finance the construction, conversion, or expansion of industrial plants and shipping centers for ownership or tenancy by small business concerns.

The Rural Development Program was established in 1955 as an interagency effort to solve some of the economic problems of rural underdeveloped areas. This program, now renamed the Rural Areas Development Program, is operating with renewed emphasis and involves cooperative efforts of many agencies, including those of the U. S. Department of Agriculture and State colleges and universities. The land-grant colleges of each of the five States of the Southeast River Basins area are active in this work.

The Area Redevelopment Act of 1961 is directed toward creating needed new employment opportunities through the development of facilities and resources. The program offers five broad types of assistance. These include loans, grants, technical assistance, planning, and occupational

training.

There is also increased opportunity under the Federal Housing Act to rehabilitate blighted residential, industrial, and commercial areas, and to obtain technical assistance and planning aid in cities, small towns, and counties.

Under provisions of the Job Training Act of 1962, trainable unemployed workers, members of farm families with low income and youths between 16 and 22 may be trained in those skills found to be in short supply.

The focal point in obtaining and utilizing assistance under these programs rests with local groups organized to effectively delineate the interests and objectives of the community and initiate action toward obtaining these objectives.

Many towns, cities, and counties in the basin have development corporations or committees. Their work generally consists of stimulating local interest in industrial development, defining local assets and liabilities, promotion, raising local money for industrial buildings and for loans, and visiting and negotiating with suitable industries. The importance of these efforts to encourage economic growth and development in all phases of the basin economy is well recognized. In their concerted effort to attract new industries, however, development groups sometimes overlook the potentialities of existing industries to expand going programs. With the same sort of help that is offered to new industries, many small enterprises could increase sales or broaden their operations. This would lead to increased production and more jobs. Such programs show immediate results, particularly for those operations which utilize local raw materials and labor.

For the longer range program, the potentials of the area must be assessed and plans made for ways to utilize them advantageously. Such plans should consider financing; location and environmental factors; facilities for transportation, water supply, and waste disposal; power requirements; market potentials; and the impact of added population on the community.

As these economic projections and associated factors indicate, the future economy of the Suwannee basin can be vigorous. It should be emphasized, however, that these projections are predicated upon the assumption that the basin economic potentials will be utilized. Only with concerted effort can the potential be developed to the level of the projections.

Social and Institutional Factors

This Report is concerned with social and institutional problems only to the extent that they have a significant bearing on the basin economy.

In many areas in the Suwannee basin where the level of economic activity is low, there seems to be limited opportunity for improving public services by increasing tax rates. A systematic program of tax equalization would probably produce significant additional revenue without an increase in the tax rate. Another possibility would be to increase efficiency of present governmental operations. Cooperative efforts among neighboring towns or even counties may permit some appreciable savings. Actual consolidation, which is being considered in some areas, may prove to be advantageous, although it is not always the panacea attributed to it. Streamlined methods, using modern equipment and processes, would save time and money.

Improvement in the pattern of local services appears to be required if many areas in the basin are to accelerate their local economy to a satisfactory pace. On the other hand, there are many areas in the basin where local services are excellent and are being improved. These areas are attracting new developments, and the disparity in economic levels between communities continues to widen. Efforts toward economic improvement in the basin have generally been localized. Towns compete with towns, counties with counties, and States with States. Competition is wholesome and desirable, but joint effort for a common good is also beneficial and does not necessarily limit competitive endeavor. For example, use of some of the basin physical resources, such as water, may not be economically feasible when considered only on the basis of each potential use individually. Nevertheless, when all uses are combined under a common objective for control and use of the resource on a cooperative basis, then each of the potential uses can bear its proportionate share of the cost and return a profit. The same analytical procedures can be applied to nonphysical resources and the same results achieved. Some community leaders realize the need for a basinwide, consolidated effort and are working toward that end.

The problems of the basin communities are not all alike, but they are of common interest. There is now no common forum for analyzing these problems and for deciding upon a unified program. Such a forum is needed. If it is to be effective, it should have some authority and perhaps some taxing powers, but it should be locally controlled and constituted so as to be respondent to the needs and desires of the people of the basin. Establishing an effective coordinating organization would undoubtedly require legislative action by both Georgia and Florida. In Florida, it might appropriately be a matter of expanding the power and duties of the existing Suwannee River Authority. A similar organization could well serve the Georgia portion of the basin, and the two groups could then coordinate their efforts toward common goals.

In addition to the need for basinwide coordination in the field of general planning, there is developing an even more urgent need for interstate cooperative effort in the field of surface-water management. Demands on the uncontrolled flows of many streams are approaching or are above the stream capabilities, and competition for water use is developing. Storage can be provided to meet foreseeable demands, but storage sites are not generally located at the exact point of need. In the Suwannee basin, water-control storage can best be provided in Georgia, even though many of the benefits from the storage will accrue to the State of Florida if the use of the stored water is regulated to provide optimum advantage. If benefits accrue to both States, then equitable costs should be borne by both States. The degree of participation should be based on some predetermined and agreed-upon operating procedures that would set forth the amounts of water to be made available in each area and the method for handling cost sharing and other related points of common interest. These agreements can generally be negotiated without difficulty before serious problems arise, but compromising may be difficult after conflicts develop.

An important institutional problem in the basin that seems to warrant immediate consideration and improvement is the generally low level of education and training. This need is particularly acute among the nonwhites who comprise nearly a third of the population. The problem is becoming more pronounced because economic growth and development involve more mechanization, automation, complex record keeping, and high-speed output. The economic history of the United States demonstrates that economic growth and development proceed more rapidly in areas where all segments of the population are adequately equipped to contribute to and participate in the total economy. Census data and other statistics consistently demonstrate that income levels are closely associated with the levels of education and training.

These problems are particularly important in those parts of the Suwannee basin where the tax base is extremely limited. In such areas, raising the education level and providing other services are difficult under existing circumstances. Even with careful management, the cost of such services continues to rise, often more rapidly than the tax base. Fixed costs, such as provision, operation, and maintenance of the necessary buildings, consume an increasing percentage of the available revenue. As the population shifts to urban areas, per capita costs in the less populated areas go up, and the problem intensifies.

Many people in the Suwannee basin are aware of their educational problems and, in spite of the difficulties confronting them, are making significant efforts to improve educational opportunities and to provide trade school and other facilities to raise employee skills. Providing training and jobs for youth entering the labor force are primary goals stressed by the Suwannee River Area Development Council in the Overall Economic Development Program prepared for consideration under the provisions of the Area Redevelopment Act of 1961. If these and other efforts are pursued and continue to be successful, the basin labor force is expected to soon have the educational background demanded by modern business. The basin cannot rest, however, on the laurels of its current progress. The standards for labor in the future will be even more stringent than they are today.

A trend now apparent in many developing areas is the rapid extension of urban functions into rural areas along the transportation routes. The problem of urban sprawl could become acute in the Suwannee basin when developments spring up along the new interstate highways that cross the basin and on the streams and reservoirs.

If the demand for service facilities, such as water supplies, sewers, schools, and roads, is to be limited to areas of reasonable concentration, and thus reasonable cost, some type of rural zoning appears to be imperative. While zoning can best be administered on a local or county basis, the Suwannee basin needs a basinwide zoning plan for the best possible uses of all areas in harmony with transportation routes, esthetic values, and other related factors. Without zoning, attempts to keep local service costs down could be extremely difficult.

While these and other problems do and will occur in the basin, they are not insurmountable. All of them are more than offset by the reserve of available resources, including land, water, and people. The "real income" potentials of the basin are not being realized under present conditions, but there are significant, and fairly obvious, opportunities for augmenting those productive resource uses that promise to raise per capita income levels.

PART TWO - NEEDS AND OPPORTUNITIES

General

This Part of the Report discusses, for each purpose, the existing facilities and programs, needs and opportunities, and means of meeting the needs for resource development in the Suwannee basin. The discussion treats each purpose individually and does not attempt to indicate or analyze the interrelationships among purposes.

Discussions of the existing programs and facilities generally provide inventory data and briefly outline programs in which Federal and State agencies participate. Private and other public interests participate and cooperate in many of the same activities and, in addition, carry out many programs and projects not listed.

The needs and opportunities discussions point out the needs, problems, and general opportunities for meeting the needs. Potential resource development is limited by: (1) The needs for each purpose geared to the number of people and the economic level of activity that are expected to prevail in the Suwannee basin as well as the rest of the Nation; and (2) the physical, financial, and political abilities of the basin to produce the material goods that are needed. These limits are intended to insure that excess material goods will not be produced and developments beyond the capabilities of the basin will not be proposed.

In the discussion of means of meeting the needs, the rather broad outline of the types of measures that might be effectively employed is based on the assumption that available resources could be used for each purpose without regard to competition from other purposes. This was done to demonstrate what is possible in each functional field and to permit treating all purposes on an equal basis when they are combined into a comprehensive plan.

There are no reports that attempt to portray the entire resources and economy of the Suwannee basin. However, several reports on specific studies and some general information reports that are applicable to the area are available. Data in these reports were used wherever practicable. A summary of the more important previous studies is included in Appendix 12.

SECTION I - FLOOD CONTROL AND PREVENTION

General

The amount of flood runoff from the rolling hills of Georgia is higher than for other areas in the Suwannee basin, but flood damages are relatively low. Of the 77,600 acres of flood plains along the Withlacoochee and Alapaha Rivers, 30 acres are urban land; 4,600, cropland; 1,800, pasture; and the remainder forest land, mostly wooded swamps.

Okefenokee Swamp is a natural detention area which stores floodwaters and regulates stream discharges over long periods of time. The only developments in Okefenokee Swamp subject to flood damage are a number of fishing and hunting camps.

Limestones, honeycombed with solution channels, are at or near the ground surface of the Suwannee-Santa Fe area. Many of the small streams of this area empty into sinkholes, so much of the surface drainage enters the limestone formations. Because of the relation between hydraulic pressures of ground and surface water, discharges from the springs are greatest during periods when streams are low. The springs have relatively little effect on floodflows.

Records of stream flood stages and volumes are being collected at the river gage stations shown on Figure 2.1. The length of record varies from 10 to 35 years, with the majority of stations having been in operation more than 25 years. In addition to the river gage stations, there are seven partial-record gages in Georgia and one in Florida where crest heights of floods are measured. The records at these stations plus historical knowledge of some floods in the years before stream gages were in operation provide a valuable record from which it is possible to eval-

FLOOD CONTROL

1960

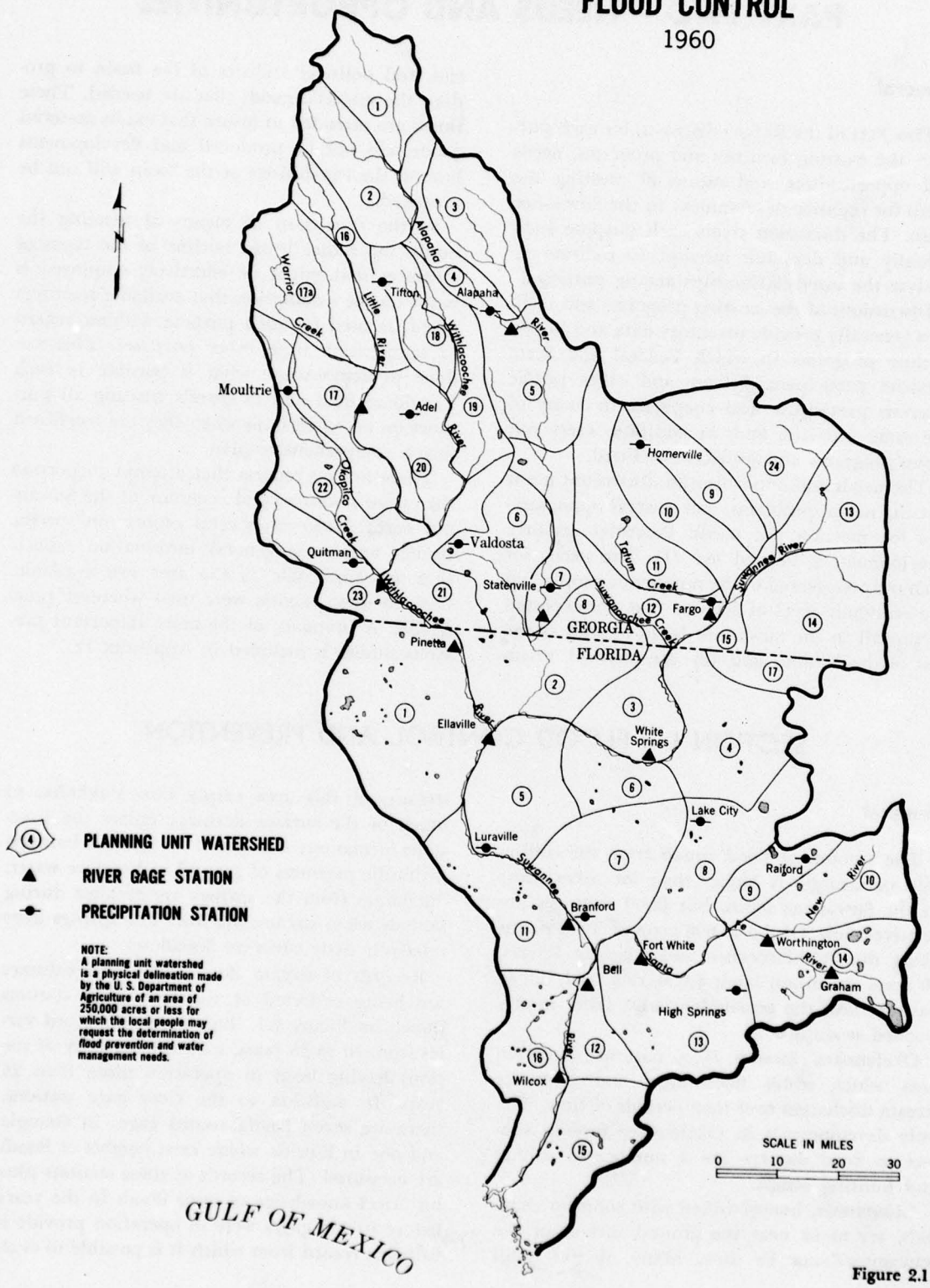


Figure 2.1

uate the flood problems of the Suwannee basin.

The main source of floodflows in the Suwannee basin are the Withlacoochee and Alapaha Rivers. Most of the flood problems, however, occur along the Suwannee River between White Springs and the river mouth and above Statenville on the Alapaha River. The flood damages on the Alapaha River flood plain are almost exclusively agricultural, while those on the Suwannee are principally sustained by urban, resort, and transportation facilities.

Spring floods are generally the result of a long wet period followed by a heavy rainstorm. The summer and fall floods are generally caused, directly or indirectly, by hurricanes. The maximum flood of record in the Suwannee basin was that of April 1948 and resulted from a 20-inch rainfall during March and early April. Seven inches fell from March 31 to April 2. The second highest flood of record was that of August 1928, when tropical storms on August 10 and 15 produced 11 inches of rainfall, following a rainy period. A smaller, but damaging, flood occurred in 1959.

The 1948 flood created the maximum flow of record for most areas in the basin. Flood peak discharges in cubic feet per second per square mile and in cubic feet per second are as follows:

Location	Drainage area (sq. mile)	Peak flood discharge (c.f.s./ sq. mile)	Peak flood discharge (c.f.s.)
Georgia			
Little River near Adel	547	71	38,800
Withlacoochee River near Quitman	1,480	45	66,000
Alapaha River near Statenville	1,400	20	27,300
Florida			
Suwannee River at White Springs	1,990	14	28,500
Santa Fe River near Fort White	1,080	11	12,300

Flood durations are long because of flat slopes in the stream channels and adjacent valleys. Floods usually rise slowly and recede slowly, and there is a lag of several days between storm rainfall and the resulting flood crest.

In the Suwannee basin, storm runoff concentrates in major streams more rapidly in the upper part of the basin. As the streams approach the Gulf, the decreasing slope of their profiles slows the movement of floodwaves. The floodwaves also subside as the water spreads out onto the flood plains. After the period of heaviest rainfall from the 1948 storm had ended, streams in various portions of the basin reached their peaks as follows:

Figure 2.2 *Alapaha River Flood, 1961. Dark Areas Show River Spreading Out Over Tilled Land.*

Location	Lag time (day)
Georgia	
Little River near Adel	1
Withlacoochee River near Quitman	3
Alapaha River at Statenville	5
Florida	
Suwannee River at White Springs	4
Suwannee River at Ellaville	7
Suwannee River at Wilcox	13
Santa Fe River near Fort White	11

In the 1948 flood the Alapaha River was out of its banks at Statenville for 35 days, the Withlacoochee was out of its banks at Pinetta for 50 days, and the Suwannee was overflowed for 40 days at Ellaville and for 65 days at Wilcox.

Existing Facilities and Programs

The Weather Bureau has no official river stations in the basin but uses the Geological Survey stream gaging stations for forecasts of Suwannee River flood stages for White Springs, Ellaville, Branford, and Wilcox, and for Santa Fe River stages at Fort White. Reports from the Geological Survey stream gaging stations and reports of heavy rainfall from the Georgia Forestry Commission and the Florida Forest Service generally

Figure 2.3 *Suwannee River at Ellaville During 1948 Flood. Transportation Was Seriously Disrupted and Physical Damage Was High.*

give the necessary data for issuing timely flood warnings.

There are no major flood control and prevention projects in the Suwannee basin, but some drainage projects alleviate local flooding. By January 1962, the Soil Conservation Service had received two applications for assistance under Public Law 566, 83d Congress, the Watershed Protection and Flood Prevention Act. The regular conservation programs of local, State, and Federal groups contribute to the improvement of hydrologic conditions through runoff and erosion control measures. A low dam at the outlet of Okefenokee Swamp, constructed by the Fish and Wildlife Service, stabilizes surface and ground water levels in the wildlife area.

Studies and plans for regulating land use are authorized under the Georgia Planning and Zoning Enabling Act of 1957 and under the Florida Zoning Enabling Act of 1939. Federal aid to assist urban areas with comprehensive planning and zoning is available under Section 701 of the Federal Housing Act of 1954 as amended. Recent Federal legislation authorizes the Corps of Engineers to advise local governing bodies about flood hazards and the desirability of flood-zoning regulations, when such information is requested.

Needs and Opportunities

In recent years many persons, appreciative of the Suwannee basin setting, have bought land in areas subject to flooding and have built or are planning to build houses and other structures. This trend is accelerating. The flood of 1948 was disastrous for some individuals but was insignificant in terms of the basin overall economy. However, repetition of the 1948 floodflow after 1975 could create a major disaster unless the water is controlled or flood plain zoning or management is made more effective.

The urban areas which will need flood control consideration are those that are expected to develop at or near highway and railroad river crossings. There are 12 highway and 6 railroad bridges across the Suwannee River and 49 highway and 24 railroad bridges over the main tributaries.

Flood damages were estimated for the 1959 and 1948 floods whose estimated frequencies are, respectively, one in 10 years and one in 50 years. Had these two floods occurred in 1960, flood damages along major streams would have totaled $264,000 for the 1959 flood and $1,195,000 for the 1948 flood. If floods of the same magnitude occur in the year 2000, the damages for the expected state of flood plain development without additional flood control developments would be $665,000 and $2,520,000, respectively. Average annual damages for all floods that might be expected to occur during the 1960-2000 period would be about $232,000.

There is need and opportunity to alleviate flood damages on the upstream tributaries. Losses include recurring damages to crops, pasture, roads, and buildings.

Means of Meeting the Needs

Measures for alleviating future flood problems could include flood forecasting, reservoir construction, channel improvements, levees, and flood plain management with zoning.

The present system of flood forecasting is generally adequate, but it can be made more effective, at a small cost, by extending the scope of forecasting to cover both high and low flows. Additional stations on the Alapaha and Withlacoochee Rivers are also desirable.

Flood plain management could be considered for areas where construction is occurring near the river without regard for flood hazards. Rural zoning is discussed in more detail in Part Four.

SECTION II – WATER SUPPLIES

General

The development and protection of safe and adequate water supplies necessary for the growth of the Suwannee basin are an important part of the public health program. The abundance of satisfactory sources makes possible the quantities of water needed for optimum development. Treatment, chlorination, and continuous surveillance of the water supplies by the health departments are required to safeguard water quality and public health.

The hydraulically connected limestone beds beneath the Suwannee basin form productive aquifers. Ground water is usually of good and uniform quality; however, in certain areas the dissolved materials exceed the recommended drinking-water standards, and treatment has been or should be provided to improve its potability and to remove hardness and other undesirable minerals. The quality of the basin surface water is also consistently suitable for municipal and industrial uses.

Assistance in developing water supplies for groups of rural homes is available under the Farmers Home Administration, and municipalities may obtain assistance from the Housing and Home Finance Agency.

Existing Facilities and Programs

Domestic Water Supplies

Domestic water supplies are defined as private supplies constructed to serve a single family. In 1960, an estimated 26,400 domestic supplies served a rural population of approximately 120,000 people. Based on a limited inventory, water consumption in the rural home, excluding water for stock and irrigation purposes, was estimated to average 50 gallons per person per day. This water use was estimated to total about 5.9 million gallons per day.

Approximately 80 percent of the domestic water supplies investigated were equipped with pressure pumps, but less than half were protected against surface contamination. Over 10 percent of the dug wells and a few shallow wells of other construction types were reported to have undependable supplies. About 35 percent were reported to need water-quality improvement.

Many of the domestic water supplies investigated were subject to bacteriological pollution because of improper construction or handling of the water. Many wells were improperly sealed, uncovered, or without pumps. Surface runoff entering some of these unprotected wells after heavy rains resulted in turbid water.

There are some reports of objectionable amounts of sulfur, iron, and hardness in the water. Removing these undesirable characteristics is practicable, but the expense involved may be more than the individual owner desires to pay. Unless the quality is seriously impaired, water users usually adapt themselves to the available supply and give little consideration to improvement of its quality.

Municipal Water Supplies

In 1960, 168,400 people were served by 60 municipal and institutional water systems. All the supplies were obtained from ground water sources. The municipal wells ranged in depth from 30 to 1,145 feet. Seven percent of these were less than 100 feet deep, and 25 percent were more than 500 feet deep. The reported

Figure 2.4 *Unprotected Spring Subject to Local and Floodwater Contamination.*

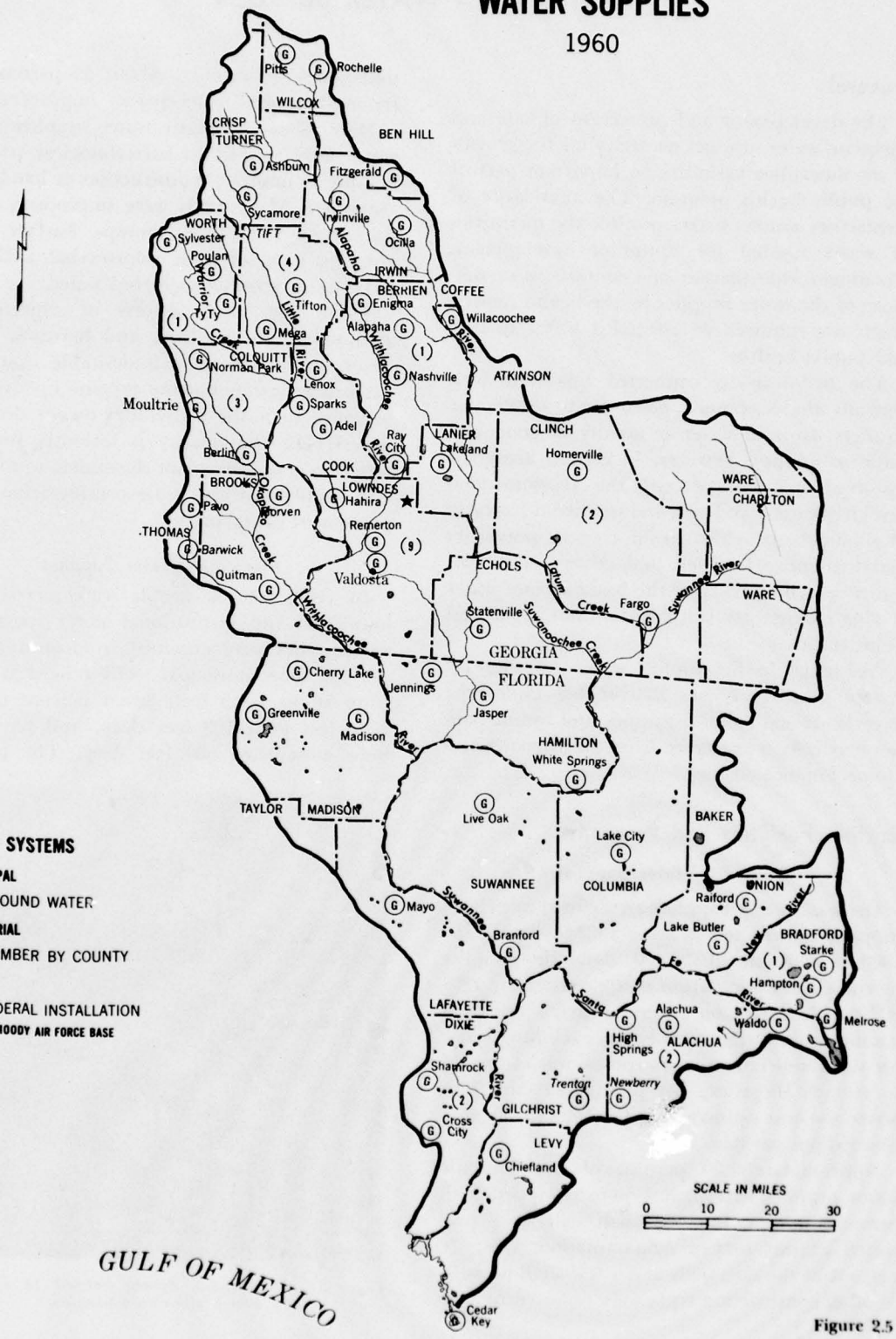

WATER SUPPLIES
1960
WATER SYSTEMS
MUNICIPAL
G GROUND WATER
INDUSTRIAL
( )NUMBER BY COUNTY
OTHER
★FEDERAL INSTALLATION
MOODY AIR FORCE BASE
GULF OF MEXICO
SCALE IN MILES
0 10 20 30
Pitts
Rochelle
WILCOX
CRISP
TURNER
BEN HILL
Ashburn
Fitzgerald
Sycamore
Irwinville
WORTH
Sylvester
TIFT
Poulan
Ocilla
IRWIN
BERRIEN
COFFEE
Tifton
Enigma
Willacoochee
TyTy
Alapaha
Mega
Alapaha River
Little River
COLQUITT
Norman Park
Nashville
ATKINSON
Withlacoochee River
Moultrie
Lenox
Sparks
Adel
Ray City
LANIER
Lakeland
CLINCH
Homerville
Berlin
COOK
BROOKS
LOWNDES
Hahira
Pavo
Morven
Remerton
Valdosta
THOMAS
Barwick
Quitman
ECHOLS
Statenville
Fargo
WARE
CHARLTON
Suwannee River
Alapaha River
Withlacoochee River
GEORGIA
FLORIDA
Cherry Lake
Jennings
Jasper
Greenville
Madison
HAMILTON
White Springs
TAYLOR
MADISON
Live Oak
Lake City
BAKER
SUWANNEE
COLUMBIA
Mayo
Suwannee River
Branford
Raiford
UNION
Lake Butler
BRADFORD
Starke
Hampton
Santa Fe River
LAFAYETTE
DIXIE
Alachua
Waldo
Melrose
High Springs
ALACHUA
Shamrock
Trenton
Newberry
GILCHRIST
Cross City
LEVY
Chiefland
Cedar Key

Figure 2.5

TABLE 2.1

Basic Data on Municipal Water Supply Systems—1960

Municipality	Population served	Source*	Treatment*	Design capacity (m.g.d.)*	Average demand (m.g.d.)*
Florida					
Alachua	2,075	W	None	1.008	0.180
Branford	690	W	HD	0.410	0.100
Cedar Key	350	W			0.050
Cherry Lake	350	W	None	0.185	0.040
Chiefland	1,460	W	D	0.216	0.120
Cross City	1,985	W	AID	1.130	0.300
Greenville	1,330	W	None	0.691	0.160
Hampton	360	W	None	0.158	0.037
High Springs	2,350	W	HD	0.590	0.246
Jasper	2,140	W	D	1.660	0.250
Jennings	500	W	D	0.144	0.050
Keystone Club Estates	100	W	D	0.260	0.100
Lake Butler	800	W	X	1.368	0.400
Lake City	9,760	W	AD	3.456	1.000
Live Oak	5,760	W	AHD	1.800	0.700
Madison	3,410	W	None	1.440	0.400
Mayo	670	W	AKD	0.331	0.080
Melrose	150	W	--	--	--
Newberry	1,060	W	D	1.944	0.150
Shamrock	350	W	F	0.100	0.050
Starke	4,800	W	D	2.880	1.000
Trenton	950	W	KD	1.037	0.125
Waldo	570	W	D	0.256	0.100
White Springs	670	W	AD	0.720	0.090
Raiford State Prison	3,500	W	D	3.600	0.800
U. S. Radar Station	60	W	D	0.228	0.032
Georgia					
Adel	4,360	W	N	4.320	0.400
Alapaha	655	W	N	0.144	0.043
Ashburn	3,950	W	D	2.300	0.250
Barwick	400	W	D	0.216	0.025
Berlin	445	W	D	0.216	0.015
Enigma	525	W	D	0.172	0.025
Fargo	1,200	W	D	0.072	0.050
Fitzgerald	10,520	W	DV	4.320	1.140
Hahira	1,300	W	None	0.390	0.075
Homerville	2,620	W	None	0.576	0.130
Irwinville	150	W	None	--	0.014
Kennedy	180	W	None	0.014	0.002
Lakeland	2,280	W	None	--	0.100
Lenox	785	W	D	0.720	0.060
Morven	400	W	D	--	0.020
Moultrie	17,765	W	D	5.760	1.700
Nashville	4,125	W	D	1.152	0.400
Norman Park	890	W	None	--	0.035
Ocilla	3,270	W	None	2.500	0.300
Omega	980	W	None	0.500	0.060
Pavo	800	W	None	--	0.033
Pitts	400	W	None	0.065	0.012
Poulan	750	W	None	--	0.060
Quitman	5,170	W	None	3.160	0.350
Ray City	600	W	D	0.432	0.012
Remerton	570	W	D	0.216	0.050
Rochelle	1,255	W	None	0.720	0.084
Sparks	1,160	W	D	0.578	0.060
Statenville	180	W	None	0.260	0.009
Sycamore	550	W	None	0.180	0.025
Sylvester	3,710	W	D	1.440	0.300
Tifton	13,850	W	AD	5.000	2.000
Twin Lakes	500	W	None	--	0.025
Ty Ty	460	W	None	--	0.014
Valdosta	31,050	W	ADFK	6.000	1.425
Willacoochee	1,060	W	D	0.578	0.100
Moody Air Force Base	2,300	W	AKD	2.160	0.750
Spence Air Force Base	500	W	D	1.000	0.300
Tifton College	550	W	D	0.216	0.030

* m.g.d. = million gallons per day; W = wells; A = aeration; D = disinfection; F = filters; H = softening; I = iron removal; K = water stabilization; V = fluoride adjustment; X = experimental unit.

Figure 2.6 *Municipal Water Storage Tank at Valdosta.*

municipal water consumption totaled 16.5 million gallons, an average of 90 gallons per capita per day. All municipal supplies are checked monthly by the State health departments for bacteriological quality. Development in the Cedar Key area is creating a local salt-water intrusion problem.

No estimate has been made of the number of the semipublic water supplies in the basin. Treatment is provided for improvement of the water quality of some of these supplies. It is estimated that 25 percent are chlorinated. The State boards of health check most of the supplies to guard against bacteriological contamination. The 1960 supplies were reported to be adequate.

Industrial Water Supplies

In 1960, 28 industries depended on private water supplies. Others obtained water from municipal systems. All the industries used wells as their basic source of supply. However, one plant used a surface supply for its boiler water because of the good chemical quality. One thermal powerplant used surface water for cooling.

The 1960 industrial water use of the private industrial systems totaled approximately 27 million gallons per day. Ground water provides for most industrial needs, including 5 million gallons per day for cooling purposes. These uses are primarily nonconsumptive and nearly all of the withdrawal is discharged to the streams as industrial wastes. All industrial supplies were reported as adequate for the 1960 demand.

Needs and Opportunities

Domestic Water Supplies

By 1975, per capita domestic water consumption is expected to increase to 70 gallons per day. With a population projection of 127,700, the total daily consumption would be 8.9 million gallons. By the year 2000, the per capita consumption is expected to increase to 100 gallons a day, but only 56,800 people will be served by domestic supplies because the rural population will decline and more and more rural inhabitants will be served by municipal systems. The daily consumption will be approximately 5.7 million gallons per day. These demands can be met without difficulty from available ground water sources.

Municipal Water Supplies

The basin ground water resources are sufficient for expected future municipal water needs. In a few areas, quality is somewhat impaired by the dissolved solid content. Overuse of the aquifer in the coastal areas could create problems of salt-water intrusion, and slow ground water movement will undoubtedly result in increased drawdown cones under some metropolitan areas. Development of surface water supplies may be

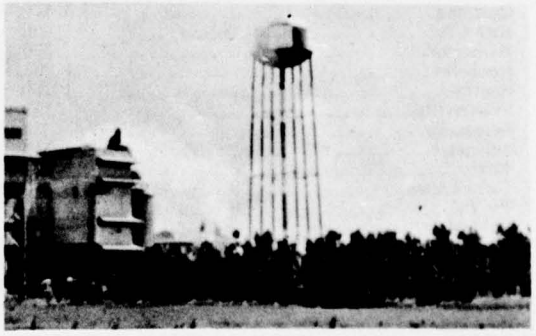


Figure 2.7 *Industrial Water Storage Tank at Paperboard Plant, Clyattville, Georgia.*

necessary as an alternative measure when the quality of the ground water is questionable or when increased pumping heads make the use of ground water too expensive.

Several municipalities reported that their water supply systems did not adequately meet 1960 needs. Improvements or enlargements to insure an adequate supply for these areas are urgent.

Estimated future water requirements are based on the assumption that water use in the municipalities will increase to 150 gallons a day per person in 1975 and to 200 gallons a day per person by the year 2000. Future needs, based on projections for each municipality, are shown in Table 2.2.

Industrial Water Supplies

Industrial water requirements are expected to increase to 37 million gallons a day in 1975 and to 64 million gallons a day by 2000. These needs can be met from either ground or surface supplies.

Means of Meeting the Needs

Domestic Water Supplies

Each owner must develop his own supply, consistent with his financial ability to do so. Drilled wells are recommended for improvement of the domestic water supplies. Shallow wells providing inadequate supplies of water should be deepened and improved. All wells should be properly sealed to protect against contamination and equipped with pressure systems to provide the benefits of an adequate pressurized water supply. A continuing program of rehabilitation and maintenance of all wells will assure satisfactory sources of supply to meet the water requirements for the year 2000.

Municipal Water Supplies

Municipalities must study, plan, and provide for their own needs. Growth, industrial development, and increased municipal water usage should be considered in planning. Technical assistance can and should be obtained from Federal, State, and private sources. There are no apparent unusual water supply problems. The future needs can be met by installing readily available equipment in accordance with standard water-works practices.

The needs for 1975 and 2000 were based on the following criteria: A minimum of two wells for each system with the total capacity exceeding maximum demands; elevated storage tanks of adequate size to store water for fire protection and thereby reduce insurance rates; distribution system extensions to serve estimated population growth; and chlorination of all supplies. Other types of treatment should be provided whenever dissolved solids exceed the recommended drinking-water standards or when the quality of the water affects its potability.

TABLE 2.2

Municipal Water Facility Needs[1]

Period	State	Population served[2]	Number of places[2]	Number of places requiring new or enlarged			Water use (m.g.d.)[3]
				Source or treatment	Elevated storage	Distribution systems	
1960 to 1975	Georgia	61,800	27	16	18	25	
	Florida	148,900	36	26	25	31	
Total		210,700	63	42	43	56	31.6
1975 to 2000	Georgia	89,900	30	10	11	28	
	Florida	261,000	42	14	20	40	
Total		350,900	72	24	31	68	70.2

NOTES: [1] All values are terminal for period indicated.
[2] Includes Federal and State installations.
[3] Million gallons per day.

Industrial Water Supplies

The water needs of 1975 and 2000 industrial development in the basin can be adequately met by the construction of new or enlarged ground or surface water supplies and the installation of treatment and water-handling equipment as required.

SECTION III – NAVIGATION

General

Development of inland commercial navigation on the Suwannee River is unlikely because lines of land transport are well established, favorable rates prevail for potential commodity movements, and there are adverse geologic and hydrologic conditions in the lower basin streams. There is a need, however, for improving the river for small pleasure boats and for maintaining adequate approach channels from the Gulf of Mexico for commercial fishing craft. Figure 4.21 shows the coastal area.

Existing Facilities and Programs

Available data indicate that at least a 3½-foot depth is available throughout most years from the mouth of the Suwannee River to Branford at mile 75. Above that point, rock shoals with rapids at low water make outboard boating unsafe, except in local areas and at high river stages. Direct access to the Gulf of Mexico from the mouth of the river is restricted during low tides to boats of less than 2-foot draft.

Some 80 years ago Congress authorized a navigation project which consisted of a 6-foot deep channel from the Gulf of Mexico through Derrick Key Gap at the south end of Suwannee Sound; a channel 5 feet deep and 150 feet wide through the river entrance shoals upstream to Branford; and a channel 4 feet deep and 60 feet wide from Branford to Ellaville at mile 127. The report on which the 1880 authorization was based also proposed a channel from Suwannee River directly to the Gulf. About 25 percent of the authorized project has been completed. The work consists of dredged cuts through the bars at the river mouth in East Pass, and in Derrick Key Gap, the removal of rock shoals, snags, logs, and other obstructions, and the construction of the few wing dams. No improvement work has been done since a reach below mile 33 was snagged and cleared in 1940. No maintenance was done between 1924 and 1962. Consequently, considerable shoaling had occurred seaward of the mouth of the river. In 1962, the channel was cleared at the mouth of East Pass.

Figure 2.8 *Mouth of Suwannee. Shallow Water Makes Navigation Difficult.*

Completion of the project would require removal of several rock shoals below Ellaville and channel widening through Derrick Key Gap.

The Suwannee River Authority, in cooperation with the Florida Department of Water Resources and the Florida Geological Survey, is constructing an experimental low dam across the river near Live Oak for improving low-flow navigation and for testing effects of such a structure on ground water levels. If the experiment is successful, local interests plan to make the structure permanent and to install a boat lift. Additional dams may be constructed at shoal areas to permit continuous boating on the river during low-flow periods.

A growing interest in the area resource development is evidenced by a 1960 report, made for local interests by a consulting engineer, on the practicability of constructing a small-boat inland waterway between the St. Johns River and the Suwannee River via the Santa Fe River. Economic feasibility studies were not included, but sufficient cost comparisons were made to pick what appeared to be the least costly of several alternative routes.

The study, which was prepared for county governments in the Santa Fe basin, concluded that the most likely route for a waterway with

a 40-foot width, 4-foot depth, and 10-foot clearance between the St. Johns River and Suwannee River would cross the Oklawaha River where it coincides with the Cross-Florida Barge Canal alignment near Orange Lake and follow existing creeks where possible. It would then proceed westward through Lochloosa Lake, angle northward through Lake Santa Fe, and turn westward again to the Suwannee River via the Santa Fe River. The proposal has not proceeded beyond the study stage.

There are 14 boat-launching sites on the Suwannee River between Ellaville and the river mouth. Nine of these are State maintained. There are four launching sites on the Sante Fe River, including one that is State maintained. There are several locally operated sites on the Suwannee above Ellaville and on the other tributaries. The town of Cedar Key, a commercial and sport fishing center about 10 miles southeast of the mouth of the Suwannee, has mooring and repair facilities for small craft.

Since 1933, commercial navigation in the Suwannee basin has been almost entirely confined to commercial fishing craft moving fish and shellfish through the coastal channels. Approximately 868 tons of seafood moved through Cedar Key in 1959.

Sport fishing boats use the coastal and delta waters extensively, and recreational outboards and skiffs use the inland rivers, where and when conditions are favorable.

Needs and Opportunities

The Suwannee River divides near its mouth into two estuaries known as West Pass and East Pass. West Pass provides the more direct route to the Gulf, but East Pass is deeper and, therefore, would be the cheaper route to develop. The authorized channel goes through East Pass and follows the coastline to a channel into open water near Cedar Key. Even if the channel to Cedar Key is further improved, there is a need for direct access to open water from the mouth of the Suwannee River.

In a survey of prospective commerce on the Suwannee River, pulpwood and petroleum products appeared to be the only commodities which would move in sufficient volume to warrant consideration of water transport. A comparison of

Figure 2.9 *Recreational Boating Becomes Increasingly Popular Each Year.*

rates for petroleum products via rail and truck with those via barge from existing terminals to distributing points in the area showed savings via barge for only one location. If a waterway was provided, pulpwood could be barged from loading points on the Suwannee River to waterfront mills at Port St. Joe and Panama City at a savings over the existing rail rate. However, mills at both ports are served by railroads.

Cedar Key is the principal base for commercial fishing boats operating in Suwannee Sound. In transiting the Derrick Key Gap route to or from the fishing grounds, vessels depend on favorable tides because at other times the depths are too shallow, and valuable operating time is often lost. Fish catches sometimes spoil if fishermen are delayed on their return trip. As a consequence, improvident crossings often result in extensive boat repair and maintenance costs.

The rapid increase in trailer-transported recreational craft during recent years has contributed substantially to boating on the river. This trend is expected to continue and would be amplified if year-round through navigation were provided from the Gulf of Mexico upstream on the Suwannee River to White Springs, Florida; up the Withlacoochee River to Valdosta, Georgia; and up the Santa Fe River to High Springs, Florida. These localities are situated at the practical upstream limits for small-boat navigation at favorable river stages unless extensive development is undertaken.

Means of Meeting the Needs

In the reach of the Suwannee from the Gulf of Mexico to Branford, Florida, small-craft benefits could be substantially realized by project maintenance already authorized. The Ellaville-White Springs reach appears to have the most recreational benefits of the several sections considered for improvement for small craft. The benefits provide justification for the small dam being constructed by the Suwannee River Authority.

Studies recently completed by the Corps of Engineers show that project maintenance is now economically justified for the reach from the mouth of East Pass through Derrick Key Gap. Local interests have been so advised, and a substantial amount of maintenance work was completed in 1962, thus eliminating substantial losses to commercial fishing.

Continued maintenance dredging to project depth from the Suwannee to the Gulf of Mexico through Derrick Key Gap and a 5-foot channel connecting the existing East Pass channel to the Gulf via West Gap could provide for increased recreational boating.

SECTION IV – RECLAMATION, IRRIGATION, AND DRAINAGE

General

Needed increases in agricultural output from the Suwannee basin will not tax the productive capacity of the land. Much of the increase in production can be achieved by in proved practices on existing acreage. Additional increases can be obtained by land conversions and land improvements such as drainage and irrigation. Analysis shows that drainage is one of the most likely methods of increasing the efficiency of farming operations and of meeting the food and fiber requirements that may remain unsatisfied after the gains achieved through improved practices. Irrigation, properly used, will counteract drought hazards. It also permits more uniformity in the quality of products, better use of land in accordance with its capability, and closer control of time of harvest.

Existing Facilities and Programs

Irrigation

More than 4 million acres of land in the Suwannee basin are suitable for irrigated agricultural use. Of the total amount of land that could be irrigated, 1,487,000 acres are cropland, 330,000 acres are pastureland, 2,104,000 are woodland, and 186,000 are in other uses. About 1.5 million acres are in Georgia and 2.5 million in Florida. Up to 55 percent of this land could be irrigated by individual farm systems.

TABLE 2.3

Principal Crops Irrigated in 1960
(acres)

Crop	Upper Coastal Plain	Lower Coastal Plain	Basin total
Vegetable	5,600	2,600	8,200
Tobacco	9,600	2,900	12,500
Corn	1,300	200	1,500
Other field crops	1,000	100	1,100
Grass and hay	700	400	1,100
Pasture	1,400	800	2,200
Orchard	100	—	100
Other	1,800	500	2,300
Total	21,500	7,500	29,000

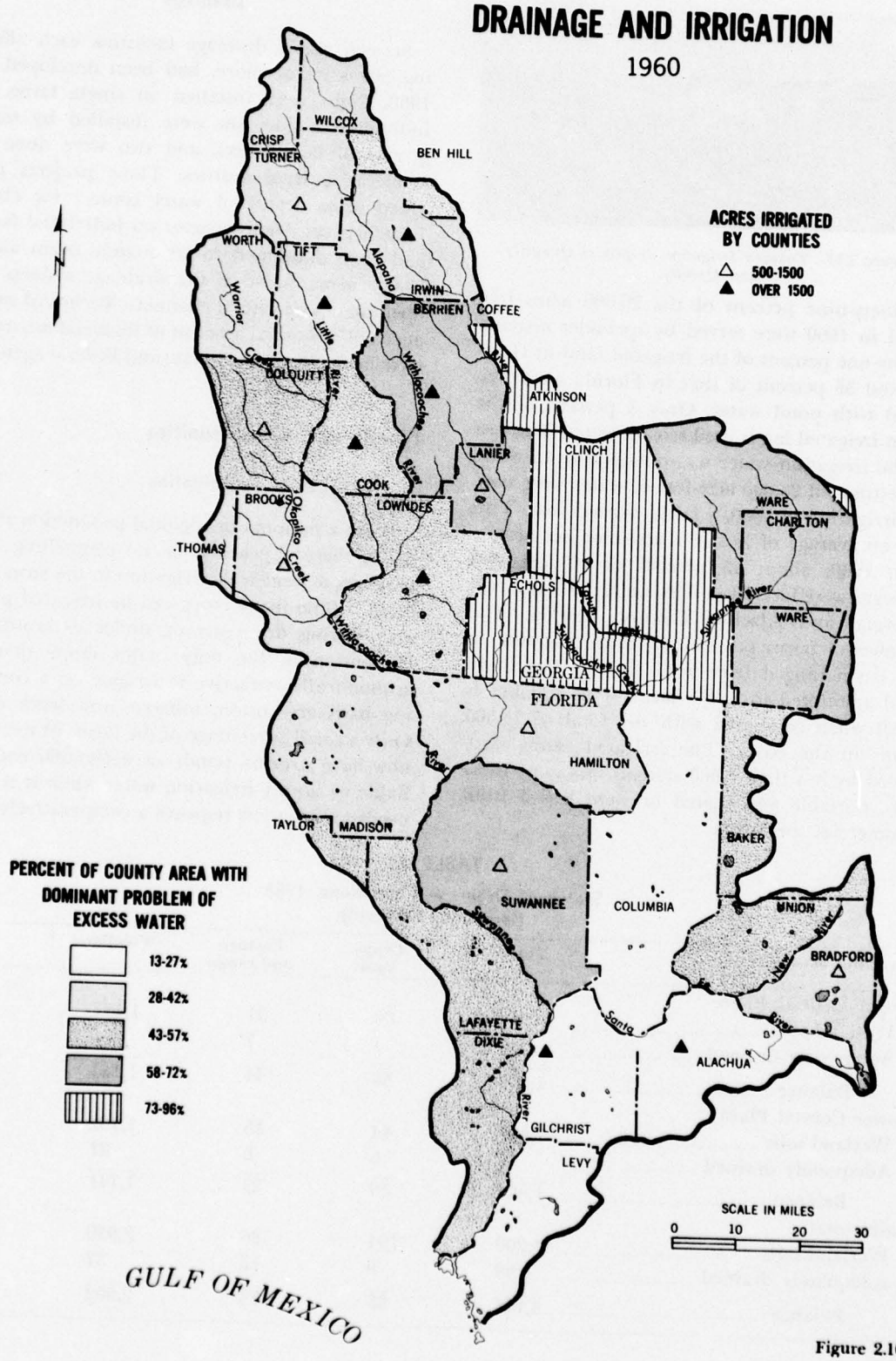

DRAINAGE AND IRRIGATION
1960
ACRES IRRIGATED BY COUNTIES
500-1500
OVER 1500
PERCENT OF COUNTY AREA WITH DOMINANT PROBLEM OF EXCESS WATER
13-27%
28-42%
43-57%
58-72%
73-96%
SCALE IN MILES
0 10 20 30
WILCOX
CRISP
TURNER
BEN HILL
WORTH
TIFT
IRWIN
BERRIEN
COFFEE
ATKINSON
LANIER
CLINCH
WARE
CHARLTON
COOK
LOWNDES
BROOKS
THOMAS
ECHOLS
GEORGIA
FLORIDA
HAMILTON
TAYLOR
MADISON
SUWANNEE
COLUMBIA
BAKER
UNION
BRADFORD
LAFAYETTE
DIXIE
ALACHUA
GILCHRIST
LEVY
Warrior
Little
Alapaha
Withlacoochee
Okapilco Creek
Suwannee River
Santa Fe River
GULF OF MEXICO

Figure 2.10

Figure 2.11 *Tobacco Irrigation Improves Quantity and Quality.*

Ninety-nine percent of the 29,000 acres irrigated in 1960 were served by sprinkler systems. Eighty-one percent of the irrigated land in Georgia and 35 percent of that in Florida were irrigated with pond water. Only 5 percent of the basin irrigated lands used stream water. The rest of the irrigation water was obtained from wells. An estimated 26,000 acre-feet of water were used for irrigation in 1960, a fairly normal year. This was an average of nearly 1 acre-foot per acre.

In 1960, about 45 percent of all irrigated acreages were located in Tift and Cook Counties, Georgia, and Alachua County, Florida. The number of farms per county using irrigation in the basin ranged from zero to 300. The basin total amounted to 2,300 farms. This number is small when compared with the total of 15,000 farms in the basin. The irrigated farms were served by less than 1,500 systems. Many of these were portable and shared or were leased from commercial specialists.

Drainage

Sixteen major drainage facilities, each affecting 500 acres or more, had been developed by 1960. Eight were installed on single farms by individual action, six were installed by small groups of landowners, and two were done by cooperative legal entities. These projects provided some degree of water control for about 112,000 acres. Small systems on individual farms had been developed to adequately drain about 59,000 acres. Most of the drainage systems are open main and lateral channels. Technical assistance and a limited amount of financial assistance have been provided by State and Federal agencies.

Needs and Opportunities

Irrigation

From a national or regional production standpoint, there appears to be no compelling need to promote large-scale irrigation in the Suwannee basin. While many crops can be irrigated profitably during dry years or under extraordinary circumstances, the only major crops that are economically attractive to irrigate on a continuing basis are cotton, tobacco, and truck crops. Only a small percentage of the farms in the basin now have streams, ponds, or wells sufficiently reliable to supply irrigation water when it is most needed. Irrigation requires a comparatively high

TABLE 2.4

Status of Drainage Conditions, 1958
(thousands of acres)

Area and status	Total	Cropland	Pasture and range	Woodland	Other
Upper Coastal Plain					
Wetland soils	1,333	60	51	1,177	45
Adequately drained	27	4	7	16	0
Balance	1,306	56	44	1,161	45
Lower Coastal Plain					
Wetland soils	1,867	44	35	1,762	26
Adequately drained	32	5	6	21	0
Balance	1,835	39	29	1,741	26
Basin total					
Wetland soils	3,200	104	86	2,939	71
Adequately drained	59	9	13	37	0
Balance	3,141	95	73	2,902	71

investment for the water supply and distribution facilities that are used only a small part of the time in this semihumid climate.

Based on the 1954-1960 trends in irrigated land use and the potential water supply, it appears that 81,500 acres might be irrigated by 1975 and about 117,000 acres by 2000. However, less acreage would be irrigated in the future if evaluated on the basis that incremental returns to the farmer, based on long-term projected prices, would at least equal the incremental operation, maintenance, and replacements costs without consideration of secondary effects or intangibles. This general guide was considered acceptable for reconnaissance studies although it was realized that followup individual irrigation developments would be subject to standard and more detailed evaluations.

Studies of the upstream watershed areas indicated that about 153,000 acres have potential for development of irrigation water supplies by project action. However, further study indicated that, based on available cost data, the development of potential projects for irrigation alone does not appear warranted. More study and investigation would be necessary to determine conclusively if the projects would be feasible under future conditions. Most of the potential projects involving irrigation could be developed by small groups or by individuals, privately financed. Development of potential projects will depend upon future national, regional, and local needs; changing economic conditions; and the determination or desires of potential beneficiaries.

Nevertheless, in the future as in the past, many farmers may prefer to undertake irrigation in lieu of other means for increasing net monetary returns from agricultural land use. Average increases in yields are estimated at 600 pounds per acre for tobacco and 260 pounds for cotton. Increases in net returns per acre can be expected to range from tens to hundreds of dollars. Increased returns, of course, are contingent upon the desirable shifts from less efficient land being made, and overall production being scaled to needs so that surpluses in the long range do not glut the market and depress prices.

Drainage

As of 1960, about 3.2 million acres of land in the basin had a dominant problem of excess water. Since only 59,000 acres of the 3.2 million acres have been adequately drained, the opportunity remains for treating more than 3.1 million acres. Of this remaining acreage, about 1.7 million acres can be drained by individual on-farm drainage systems and 1.4 million acres would require project facilities.

In estimating the future agricultural production which could be realized from the basin without new drainage and other resource development, consideration was given to the 56,000 acres of land which might be withdrawn from agricultural use by the year 2000. While offsetting land conversions may be made, increased demands for crops and pasture will require major increases in production per acre. There are, therefore, opportunities for additional drainage to help meet the projected production needs. For example, a significant part of the projected need to increase annual yields by 113 million pounds of tobacco and 9 million bushels of corn from 1960 to 2000 can be provided through drainage.

In 1958, more than 866,000 acres of the cropland had a dominant problem of unfavorable soil condition such as low fertility, stoniness, shallowness to rock or some other condition that limits root development, or low moisture-holding capacity. By 2000, only 719,000 acres of such land will probably be used for cropland. The loss of the 147,000 acres could be partially offset by draining wetlands better adapted for crop production and for facilitating soil conserving adjustments in land use elsewhere. Such land use

Figure 2.12 *Farm Drainage, Tift County, Georgia. Drainage Intensifies Land Use.*

conversion and improved drainage will frequently provide opportunities for increasing farm income, replacing marginal farmland, and increasing the efficiency of farm operations.

Few tile drains have been installed, but if more intensive use is made of the wetland soils, additional opportunities exist for the installation of tile drains on some soil types.

Woodland water control requirements are shown in Section VII, Forest Conservation and Utilization. About 71,000 acres of wetland classed as "other" were inventoried but excluded from the studies since such land will remain primarily in nonagricultural use.

Means of Meeting the Needs

Irrigation

Some irrigation is essential if the area is to make the most effective overall use of its land and water resources. The future use of irrigation is expected to meet individual farm needs and desires rather than to become an extensive production practice. Irrigated acreage will be expanded as justified by agricultural production demands to the extent that such demands can be more economically met by irrigation than by other inputs. Wisely used, irrigation can make other applied technologies more effective and can help to stabilize returns on investments.

In the process of replacing marginal farmland and increasing the efficiency of farming operations during the next 40 years, individual farmers are expected to expand their irrigation operations. Most of the irrigated acreage is expected to have sprinkler systems on scattered or isolated tracts throughout the basin.

About one-third of the total water stored in farm ponds, expected to number about 7,900 by 2000, can be used to meet irrigation water requirements. This and other water consumed would have little effect on the ample water supply of the basin.

Drainage

Development of farm drainage systems and farm-by-farm application of water management principles and techniques are necessary to realize the full benefits of drainage. These programs could result from private initiative and expenditures. Onfarm outlet channels, mains, laterals, and surface field ditches would continue as the major types of systems used. Drainage works required on individual farms, together with minor lateral ditches and other works required to serve a group of farms, are generally considered a non-Federal responsibility within the financial capabilities of local interests. Additional tile mains and laterals and pumping may also be used in applicable areas.

In addition to the individual drainage systems, multiple-purpose flood prevention and drainage projects could be used to alleviate drainage problems requiring project facilities.

To meet the drainage needs will require: (1) Full participation by landowners who have the responsibility of deciding whether or not to drain, (2) adequate outlets for all individual onfarm and small group drainage, and (3) markets adequate to handle increased production.

The existing technical and financial assistance programs of the U. S. Department of Agriculture could be utilized in the installation of drainage facilities on additional areas. Accelerated educational services could facilitate drainage developments by making known the results of research and field trials on drainage practices, methods, equipment, operations, and management.

Full consideration should be given by landowners and governmental interests involved to all alternative uses before detailed plans are decided upon. Alternative plans for drainage could involve essentially a change in areas drained or adoption of other technological improvements or other management practices.

SECTION V – HYDROELECTRIC POWER AND INDUSTRIAL DEVELOPMENT

General

Industrial development is discussed in Section IV of Part One.

The electric power market area under consideration encompasses several States and several electric power supply areas as defined by the Federal Power Commission. The Suwannee basin takes in a part of two of the power supply areas. The Georgia portion of the basin is in one power

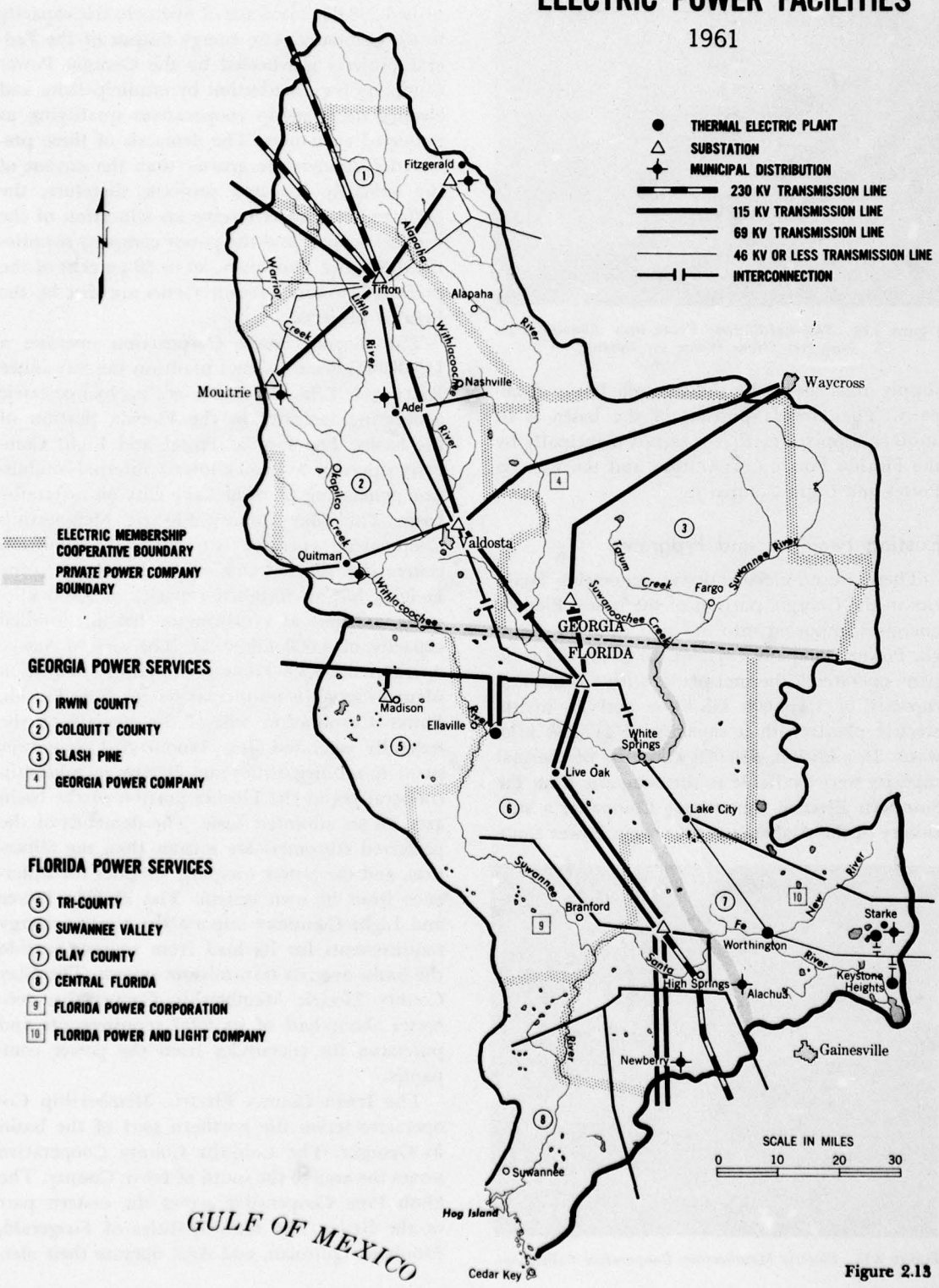

ELECTRIC POWER FACILITIES
1961
THERMAL ELECTRIC PLANT
SUBSTATION
MUNICIPAL DISTRIBUTION
230 KV TRANSMISSION LINE
115 KV TRANSMISSION LINE
69 KV TRANSMISSION LINE
46 KV OR LESS TRANSMISSION LINE
INTERCONNECTION
ELECTRIC MEMBERSHIP COOPERATIVE BOUNDARY
PRIVATE POWER COMPANY BOUNDARY
GEORGIA POWER SERVICES
1 IRWIN COUNTY
2 COLQUITT COUNTY
3 SLASH PINE
4 GEORGIA POWER COMPANY
FLORIDA POWER SERVICES
5 TRI-COUNTY
6 SUWANNEE VALLEY
7 CLAY COUNTY
8 CENTRAL FLORIDA
9 FLORIDA POWER CORPORATION
10 FLORIDA POWER AND LIGHT COMPANY
Fitzgerald
Tifton
Alapaha
Moultrie
Nashville
Adel
Waycross
Quitman
Valdosta
GEORGIA
FLORIDA
Madison
Ellaville
White Springs
Live Oak
Lake City
Branford
Worthington
Starke
High Springs
Alachua
Keystone Heights
Newberry
Gainesville
Suwannee
Hog Island
Cedar Key
GULF OF MEXICO
Warrior
Little River
Withlacoochee River
Alapaha River
Okapilco Creek
Withlacoochee
Suwannee River
Talum Creek
Fargo
Suwannochee Creek
Suwannee
New River
Santa Fe River
SCALE IN MILES
0 10 20 30

Figure 2.13

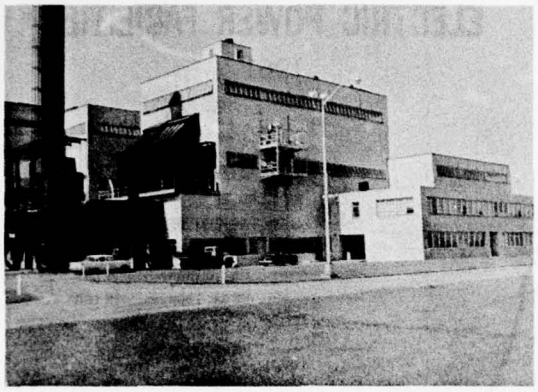


Figure 2.14 *Thermal-Electric Plant near Ellaville Uses Suwannee River Water for Cooling.*

supply area, served by the Georgia Power Company. The Florida portion of the basin is in another supply area that is served principally by the Florida Power Corporation and the Florida Power and Light Company.

Existing Facilities and Programs

There are no electric power generating facilities in the Georgia portion of the basin. Electric energy is imported into the area over the Georgia Power Company's system. In 1959, the company operated 7 thermal plants with a combined capacity of 1,414,000 kilowatts and 21 hydroelectric plants with a capacity of 417,250 kilowatts. In addition, 250,000 kilowatts of thermal capacity were available to the company from the Southern Electric Generating Company, a subsidiary of the Alabama and Georgia Power Companies. The Corps of Engineers projects furnished 298,000 kilowatts of hydroelectric capacity to the company. The energy output of the Federal projects is wheeled by the Georgia Power Company for distribution by municipalities and electric membership cooperatives qualifying as preferred customers. The demands of these preferred customers are greater than the output of the federally operated projects, therefore, the preferred customers receive an allocation of the Federal output, and the power company supplies the difference. Currently, 20 to 30 percent of the preferred-customer requirements are met by the Federal projects.

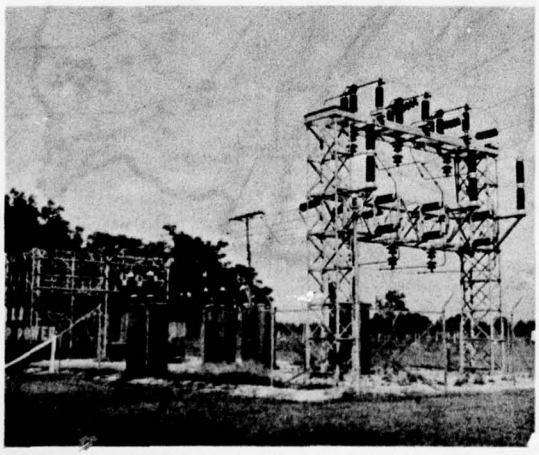


Figure 2.15 *Electric Membership Cooperative Substation.*

The Florida Power Corporation operates a 135,000-kilowatt thermal plant on the Suwannee River near Ellaville. There are no hydroelectric generating facilities in the Florida portion of the basin. The Florida Power and Light Company operates a 1,500-kilowatt internal-combustion generating plant at Lake City on a standby basis. The Clay County Electric Membership Cooperative operates two internal-combustion generating plants. One of these at Keystone Heights has an installed capacity of 3,900 kilowatts, and one at Worthington has an installed capacity of 4,600 kilowatts. The city of Starke operates a 6,500-kilowatt internal-combustion plant to serve its municipal system. The Florida Power Corporation wheels the output of the federally operated Jim Woodruff hydropower plant to municipalities and electric membership cooperatives in the Florida portion of the basin area on an allocated basis. The demands of the preferred customers are greater than the allocation, and the power company supplies the difference from its own system. The Florida Power and Light Company imports the electric energy requirements for its load from sources outside the basin over its transmission system. The Clay County Electric Membership Cooperative generates about half of its total requirements and purchases the remainder from the power companies.

The Irwin County Electric Membership Cooperative serves the northern part of the basin in Georgia. The Colquitt County Cooperative serves the area to the south of Irwin County. The Slash Pine Cooperative serves the eastern part of the basin. The municipalities of Fitzgerald, Moultrie, Quitman, and Adel operate their elec-

tric distribution systems. The Georgia Power Company serves the rest of the municipalities and urban centers.

About one-third of the Tri-County Electric Membership Cooperative service area is in the western part of the Florida portion of the basin. The Suwannee Valley Electric Membership Cooperative serves the north Florida part of the basin. The Clay County Cooperative serves the southeastern part of the basin, and the Central Florida Cooperative serves the southern part of the basin. The municipalities of Starke, Alachua, and Newberry operate their own distribution systems. Load data for Alachua and Newberry were incomplete; therefore, their loads were considered as part of the utility company loads. The Florida Power and Light Company serves the southeastern part of the basin up to Lake City. The Florida Power Corporation serves the remaining parts of the basin in Florida.

Needs and Opportunities

The electric power requirements outlined herein are values estimated on the basis of published records and maps of the service areas. These approximations give the general magnitude of total requirements and provide a broad base from which to project future requirements.

The historic load of the electric membership cooperatives was analyzed by customer-class components. These components included farm and nonfarm, commercial and industrial, and other customer classes. The trend in customer growth and usage per customer was analyzed. Based on the historic trend and factors such as population shifts, changes in the industrial economy, changes in agricultural crop patterns, and other economic factors, projections for each customer class were made for the years 1975 and 2000. Municipal electric loads were analyzed by class of customer and usage per customer, and projections were made on a similar basis for the years 1975 and 2000. Utility company growth was projected for the years 1975 and 2000. The projection was based on the past trend in system growth as modified by the area being served, saturation of appliances in residential loads, increased automation in commercial and industrial loads, and by other economic factors.

There are several urban areas in the Suwannee

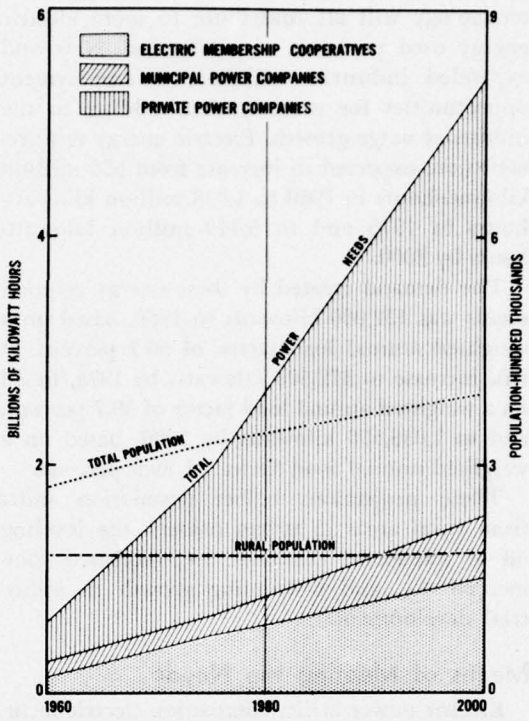


Figure 2.16 *Power Needs and Population.*

basin which are commercial and industrial centers and which have shown a rapid electric-load growth. This growth can be expected to continue to 1975. The long-range forecast, however, should be tempered by the long-range factors that may operate to slow down the explosive electric load growth experienced during the past three decades. It is expected that, by 1975, most medium and higher priced homes will be constructed with central air conditioning. The use of freezers, refrigerators, ranges, water heaters, dryers, and other electrical appliances will have reached a high level. Therefore, increases in residential demands were assumed to depend mainly on new residences and additional types of uses that are expected to develop as new electrical devices for the home are introduced. Total usage in commercial loads would continue to increase as more service industries, particularly in the recreation field, locate in the area. Industrial energy usage will continue to increase. The greater use of labor-saving machinery, automation, improvements in production methods, and changes in

technology will all contribute to more electric energy used per unit of production. New and expanded industries will furnish employment opportunities for more workers adding to the industrial usage growth. Electric energy requirements are expected to increase from 656 million kilowatt-hours in 1960 to 1,948 million kilowatt-hours in 1975 and to 5,449 million kilowatt-hours by 2000.

The demand created by these energy requirements was 132,000 kilowatts in 1960, based on a weighted annual load factor of 56.7 percent. It will increase to 372,500 kilowatts by 1975, based on a weighted annual load factor of 59.7 percent, and to 1,038,500 kilowatts by 2000, based on a weighted annual load factor of 59.9 percent.

These projections reflect population shifts from rural areas to urban centers, the leveling off of residential customer use, increased commercial use, and continuing growth in industrial development.

Means of Meeting the Needs

Electric power utility companies, electric membership cooperatives, and municipalities all have expanded their generating and transmission facilities to meet increasing demand. There is reason to believe that they will be able and willing to continue their expansion programs, as required, to meet the loads. There is, however, a real need in these systems for hydroelectric plants to provide peaking capacity.

In an effort to identify potential peaking capacity, a power potential on the St. Marys River near Macclenny, Florida, has been investigated. To increase the water flow, a plan envisaged diverting water by way of Suwanoochee Creek from the Alapaha River south of Lakeland, Georgia, to a reservoir created by a dam on the Suwannee River near White Springs, Florida. From the White Springs reservoir a canal would connect to the reservoir created by a dam on the St. Marys River at the Macclenny site. The power potential would utilize a gross head of 60 feet, develop 60,000 kilowatts of peaking capacity, and have an annual generation of 75 million kilowatt-hours of energy. Reversible-turbine installations were considered, but pump storage was found to be infeasible. The conventional development would pay for the power facilities but would cover too little of the storage cost.

Other reservoir sites being considered for multiple-purpose development were also studied as possibilities for power developments. These reservoirs would all provide small but constant releases to maintain desirable flows downstream from the dams. Head differentials between the reservoir and downstream water surfaces are low, ranging from 30 to 60 feet. It was found that power development was not practical on an individual-plant basis. There is a definite possibility, however, that a local electric membership cooperative or utilities company might be able to construct and operate one or more of the plants at a profit as a part of their existing systems. The plants could be operated by remote control or on a semiautomatic basis and supervised by regular personnel of the cooperators, thus reducing net annual costs to a minimum. There would appear to be no reason why suitable arrangements could not be made for such use of the falling water if it appears to be justified when more detailed plans are made.

SECTION VI – SOIL CONSERVATION AND UTILIZATION

General

Soil conservation and utilization consists of both enduring and recurring or short-term practices to protect the basic land resource and to provide a stable base for permanent agriculture. Enduring conservation practices include critical area planting, land smoothing, terracing, pond construction, grassed waterways, and various types of more or less permanent plantings. Recurring conservation practices include conservation cropping systems, contour farming, and cover cropping.

This Section is largely confined to a discussion of soil conservation and utilization of cropland and pasture. Cropland includes all land reserved for crop-growing purposes; land planted to a crop that resulted in a failure; land being fallowed one season for use in a later season; or land not used in a given year; i.e., idle cropland.

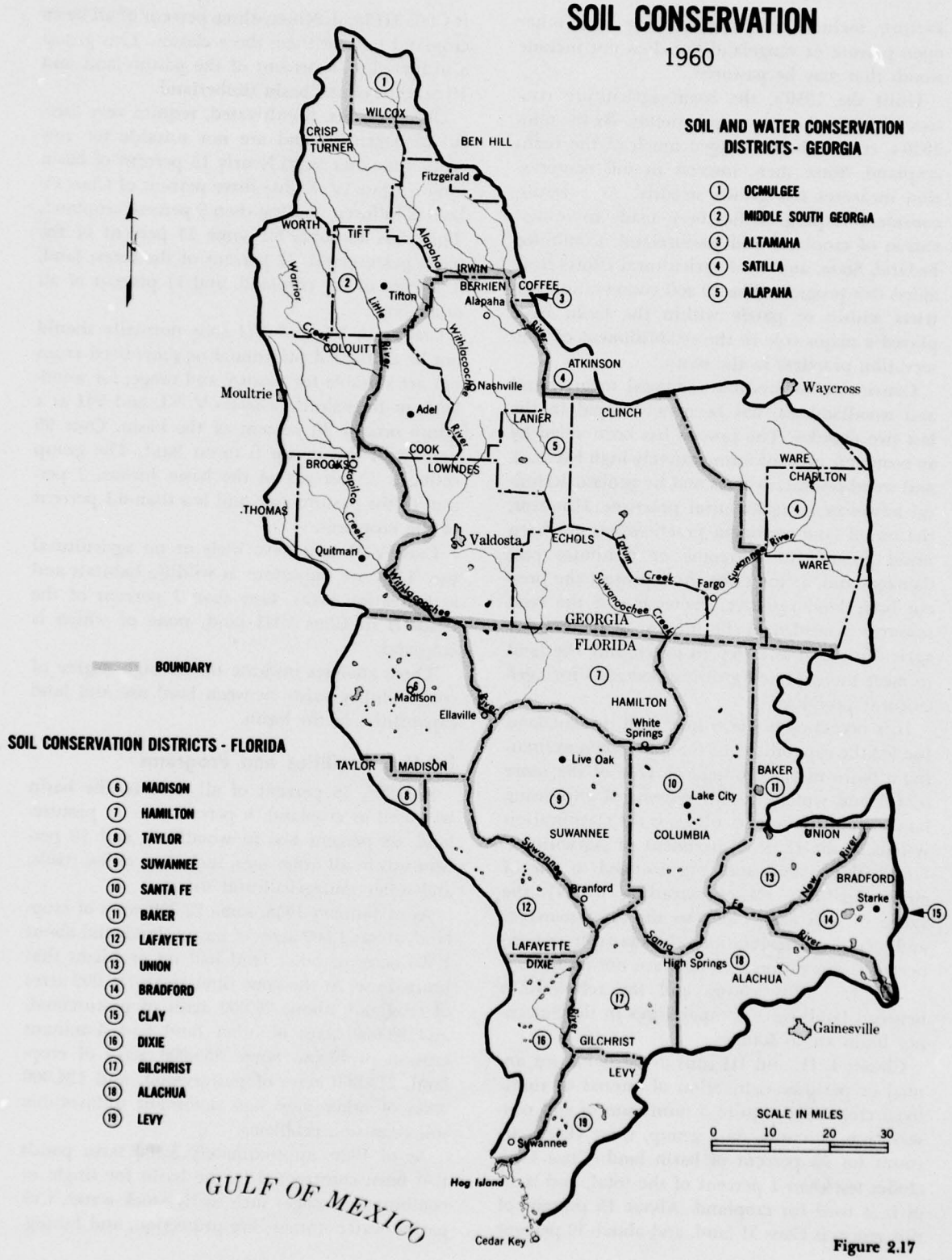

SOIL CONSERVATION
1960
SOIL AND WATER CONSERVATION DISTRICTS- GEORGIA
1 OCMULGEE
2 MIDDLE SOUTH GEORGIA
3 ALTAMAHA
4 SATILLA
5 ALAPAHA
BOUNDARY
SOIL CONSERVATION DISTRICTS - FLORIDA
6 MADISON
7 HAMILTON
8 TAYLOR
9 SUWANNEE
10 SANTA FE
11 BAKER
12 LAFAYETTE
13 UNION
14 BRADFORD
15 CLAY
16 DIXIE
17 GILCHRIST
18 ALACHUA
19 LEVY
WILCOX
CRISP
TURNER
BEN HILL
Fitzgerald
WORTH
TIFT
IRWIN
BERRIEN
COFFEE
Tifton
Alapaha
COLQUITT
ATKINSON
Moultrie
Nashville
Waycross
Adel
LANIER
CLINCH
COOK
LOWNDES
WARE
CHARLTON
BROOKS
THOMAS
Quitman
Valdosta
ECHOLS
Fargo
GEORGIA
FLORIDA
HAMILTON
White Springs
Madison
Ellaville
TAYLOR
MADISON
Live Oak
Lake City
BAKER
SUWANNEE
COLUMBIA
UNION
BRADFORD
Starke
Branford
LAFAYETTE
DIXIE
High Springs
ALACHUA
Gainesville
GILCHRIST
LEVY
Suwannee
Hog Island
Cedar Key
GULF OF MEXICO
SCALE IN MILES
0 10 20 30

Figure 2.17

Pasture includes cropland pasture and other open pasture or rangeland but does not include woods that may be pastured.

Until the 1930's, the basin agriculture consisted largely of a row crop economy. By the mid-1930's, erosion had damaged much of the basin cropland. Since then, interest in soil conservation measures has grown steadily. As a result, considerable progress has been made in conservation of cropland and pastureland. Combined Federal, State, and local agricultural efforts have aided this progress. The 19 soil conservation districts within or partly within the basin have played a major role in the establishment of conservation practices in the basin.

Conversion of erodible cropland to grassland and woodland use has been most rapid in the last two decades. The process has been aided by an economic cycle of comparatively high livestock and wood-products values and by general technical advances in agricultural practices. However, the use of land-treatment practices has not been rapid enough to overcome or minimize past damages and, at the same time, protect the present basic land resource. Protection of the land resource is needed in the interest of present-day agriculture and as a step in developing the land to meet the expected growing demands for agricultural products.

It is necessary to know how well present land use fits the capabilities of the land when evaluating a basin resource potential. One of the more useful and widely known systems of expressing land capability for agriculture is the classification system of the U. S. Department of Agriculture. Under this system, soils are assigned to one of eight capability classes according to (1) the range of uses each offers to the land manager and (2) the deteriorations the manager can expect if conservation measures are not applied.

The capability classes and the relationship between land use and capabilities in the Suwannee basin are as follows:

Classes I, II, and III soils are suitable for annual or periodic cultivation of annual or short-lived crops and require a minimum of soil conservation practices. As a group, these classes account for 55 percent of basin land. Class I includes less than 1 percent of the total, and most of it is used for cropland. About 15 percent of this group is Class II land, and about 39 percent is Class III land. Ninety-three percent of all basin cropland falls in these three classes. This group also includes 79 percent of the pastureland and 40 percent of the basin timberland.

Class IV soils, if cultivated, require very careful management and are not suitable for row crops year after year. Nearly 15 percent of basin land is Class IV. Eighty-three percent of Class IV land is in forest and less than 9 percent cropland. This class accounts for some 14 percent of the basin pastureland, 17 percent of the forest land, 6 percent of the cropland, and 11 percent of all other land.

Classes V, VI, and VII soils normally should not be cultivated for annual or short-lived crops but are suitable for pasture and range, for woodland, or for wildlife. Classes V, VI, and VII as a group occupy 30 percent of the basin. Over 95 percent of this group is forest land. The group contains 42 percent of the basin forests, 7 percent of the pastureland, and less than 0.1 percent of the cropland.

Class VIII soils have little or no agricultural use. They are important as wildlife habitats and as recreation areas. Less than 1 percent of the basin is in Class VIII land, none of which is cropland.

These analyses indicate that a high degree of compatibility exists between land use and land capabilities in the basin.

Existing Facilities and Programs

In 1959, 16 percent of all land in the basin was used as cropland, 6 percent was in pastureland, 68 percent was in woodland, and 10 percent was in all other uses, including cities, roads, and other nonagricultural uses.

As of January 1958, some 22,300 acres of cropland, about 1,300 acres of pastureland, and about 1,300 acres of other land had no problems that limited use. At the same time, some 436,000 acres of cropland, about 79,000 acres of pastureland, and 82,000 acres of other land had dominant erosion problems. Some 865,000 acres of cropland, 213,000 acres of pastureland, and 124,000 acres of other land had dominant unfavorable soil condition problems.

As of 1960, approximately 3,300 farm ponds had been constructed in the basin for single or combination usages such as livestock water, irrigation water storage, fire protection, and fishing.

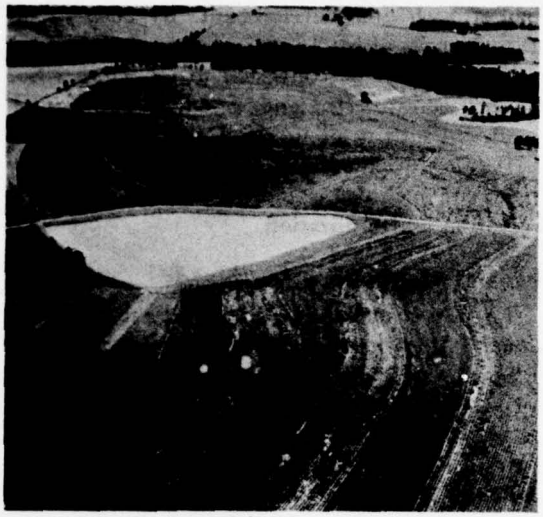


Figure 2.18 *Farm Pond, Typical of Many Suwannee Basin Upstream Developments.*

They ranged in size generally from about four surface acres to a little over six surface acres and covered about 14,200 acres, or about a third of the area in small water bodies in the basin. About 60 percent of these ponds were used for livestock water, about 39 percent for irrigation water storage, and about 43 percent provided some fishing.

Erosion is a problem in the basin. Some of the land is hilly, and many of the soils are easily eroded. Where slopes are steep and topsoil depths are shallow, more extensive plant cover is needed. Generally, forest land and pastureland have adequate cover to maintain plant food and soil characteristics. There is adequate cover on about 40 percent of the cropland and one-half of the other land.

The several State and Federal soil and water conservation and utilization programs provide credit, technical assistance, and education and information services.

Organized watershed programs in the basin are virtually nonexistent. Two applications for watershed protection projects had been submitted to the State Soil Conservation Committee of Georgia for consideration by January 1962. One application is for the 8,750-acre Bay Branch-Mill Branch watershed in Ware County, and the other is for the 47,000-acre Cat Creek watershed in Berrien, Lowndes, and Lanier Counties. Project-type action under the watershed-protection program may involve, either singly or in combination, flood control, drainage, irrigation, recreation, sediment damage reduction, agricultural water management, or other features. Other installations and developments which might affect, or be affected by, soil conservation and utilization programs include defense and other government installations, roads, mining, and urban and industrial areas.

Needs and Opportunities

In order to meet the estimated food and fiber needs by the year 2000, overall agricultural production must double on somewhat less farmland. To attain such an objective, yields must be increased even though some crops are currently in surplus supply. Improved management and the establishment of conservation measures can aid in the realization of such increases. Extensive physical opportunities exist for temporary conversion of cropland now producing surplus food and fiber to hunting areas or other recreation uses. These areas can be returned to cultivation if and when needed.

Although problems related to erosion are not nearly as severe as in some other Southeast River Basins areas, it continues to be a hazard to land use. Many of the Upper Coastal Plain soils are easily eroded.

Row crop acreages in the future may decrease slightly, but livestock numbers and pasture acreages may increase. Some 1,556,000 acres were in cropland and pastureland in 1959. By 2000, 1,738,000 acres are expected to be used as cropland and pastureland. This will increase the needs for conservation treatment of open land. By the year 2000, some 1,273,000 acres of cropland and pastureland, or about 73 percent of the

Figure 2.19 *Strip Cropping Conserves Moisture, Helps Control Erosion.*

total land devoted to such uses, are expected to be in need of some type or types of conservation treatment.

Considering land use adjustments and conservation treatment previously applied, it is expected that, by the year 2000, there will be 289,400 acres of cropland in need of treatment because of erosion problems. In addition, 592,700 acres of cropland are expected to need treatment because of an unfavorable soil condition. Some 390,600 acres of pastureland and rangeland are expected to need one or more conservation treatments, as outlined in Table 2.5.

TABLE 2.5

Treatment or Control Needed for Pasture (thousands of acres)

Type of treatment	Area
Establish or reestablish vegetation	202
Improve vegetative cover	140
Reduce overgrazing	160
Protect from fire	99
Erosion problems	26
Rodent control	6
Noxious plant control	61

Some of the above treatment or control measures may be expected to be applied on the same acreage. Solutions include management of soil, water, livestock, and vegetation.

By the year 2000, about 70 percent of the basin conservation treatment needs on both cropland and pastureland will be located in the Upper Coastal Plain.

Additional farm ponds will be needed in the basin to provide a share of the small impoundment fishing demands and provide water for livestock, irrigation, recreation, and a part of the conservation needs of many farms. By 2000, the number of farm ponds should increase to about 7,900. This would add some 19,700 acres of additional surface water on farms.

Land conversion or the shift in type of land use will be a continuous process in the basin. About 8,500 acres in Land Capability Classes V to VII were planted to crops in 1959. Most of this acreage will likely shift to land more suited to cropping. Other shifts will be needed to fit a particular crop to a specific soil type. Still other shifts will be needed to replace land lost to urban growth and development. By 2000, some 131,000 acres of land now in pasture, woods, and other uses will be converted to cropland. Also, 189,600 acres of cropland, woodland, and other land will shift to pastureland and rangeland.

Data on woodland needing conservation treatment are included in Section VII, Forest Conservation and Utilization.

Means of Meeting the Needs

High-level management to meet the needs for conservation treatment on cropland includes the following: (1) Selection and rotation of crops; (2) control of excess water with drainage, vegetated waterways, contour operations, and structures; (3) use of correct amounts of commercial fertilizer, lime, and manure; (4) maintenance of organic matter at high levels; (5) improvement and maintenance of soil productivity and workability; (6) conservation of soil materials, plant nutrients, and soil moisture; (7) selection of proper planting and seeding times; (8) use of improved tillage methods; (9) control of weeds, insects, and plant diseases; and (10) use of proper combinations of soil and water conservation practices and measures. These measures include multiple-use farm ponds.

High-level management for pasture includes management of soil, livestock, and vegetation. Soil management includes the application of lime, nitrogen, phosphate, potash, and other nutrients in the proper amounts as determined from the results of soil tests. Nutrients applied in sufficient quantities to grow plant cover would protect the soil and provide livestock forage. The number of livestock and the grazing period could be regulated so that pasture plants could develop vigorously during the growing season. Vegetative management would include proper mowing, the use of chemicals for weed and brush control, and fire protection.

To aid in meeting the conservation needs, the following erosion control and soil management special study information would be helpful: Erosion equations with factors to predict erosion losses under specific soil, slope, and other conditions; additional data to determine proper stripcropping widths, grade, and direction; design factors for maximum allowable terrace and row grades; more precise data to determine the length of time grass-legume sods should occupy the land

for maximum benefit to soils and crop yields; basic studies on reasons for increases or decreases in yield following lime applications; and studies to determine the best time and method for planting cool-season cover crops on cropland and in pecan orchards.

Selected plant management studies are needed to insure that livestock production continues as an important enterprise. Data on costs and returns of conservation farming practices and systems are needed. Intensive studies could be made on how to reduce and, if possible, avoid the detrimental effects of land-use shifts. Studies are needed of the institutional, educational, and social factors that influence farmers to apply, or not to apply, soil conservation practices and plans. Data are needed to enable technicians to make improved estimates of the need for cost sharing for various practices in watershed programs.

Technical assistance now available, and which should be continued, consists primarily of the development of complete conservation farm plans which include the needed conservation practices and measures required for use of the land within its capability. Assistance required for design, layout, and establishment of practices would continue to be provided. To carry out the soil and water conservation measures to meet the expected changes in land use, the technical assistance expected under the going programs can fulfill the demands for the planning and establishment of the practices necessary for conservation treatment of land according to its needs for the years 1975 and 2000.

Comprehensive soil conservation and utilization programs for large areas with many variations in physical and economic conditions and with many types of ownership and management cannot be expected to be applied in their entirety. To keep the program current, periodic reviews of soil conservation and utilization program needs are necessary.

It generally is not practicable to develop project action for land treatment alone. However, land treatment in combination with structural measures for flood prevention or similar purposes is often attractive to the farmer. Land treatment measures usually improve hydrologic conditions, reduce sediment production, and assist in the reduction of runoff. Needed land treatment measures are normally applied farm by farm under going agricultural and conservation programs. Accelerated land treatment and the stabilization of critical areas is expected to continue under the provision of Public Law 566, 83d Congress, the Watershed Protection and Flood Prevention Act, where such action is needed to help solve the problem in a designated watershed.

SECTION VII – FOREST CONSERVATION AND UTILIZATION

General

The Suwannee basin is an important wood-producing area. To assist in meeting anticipated national demands, it can and should increase timber production two and one-half times by the year 2000.

Existing Facilities and Programs

Forests occupy 4,705,000 acres, or 68 percent, of the basin land area with 2,358,000 acres in Florida and 2,347,000 acres in Georgia. About 25,000 acres of forest land are classed as noncommercial. There are approximately 128,000 acres of commercial forest land in Federal ownership, including 119,000 acres under national forest administration. Public non-Federal ownerships include 65,000 acres of forest land. The remaining commercial forest land is owned or under long-term leases by pulp and paper companies, including 1,746,000 acres that are part of farm enterprises and 964,000 that are held by nonresident owners.

Pine types occupy more than half the forest area. Longleaf and slash pine are the principal species. Bottom land hardwoods, the next most common type, are normally confined to areas bordering major rivers and tributaries. Principal species in this group are black gum, cypress, ash, maple, and oaks. Oak-pine types are found scattered throughout the basin and are mostly hardwoods of the sweet gum, hickory, and oak species, mixed with occasional pine. Upland-hardwood

FORESTRY

1960

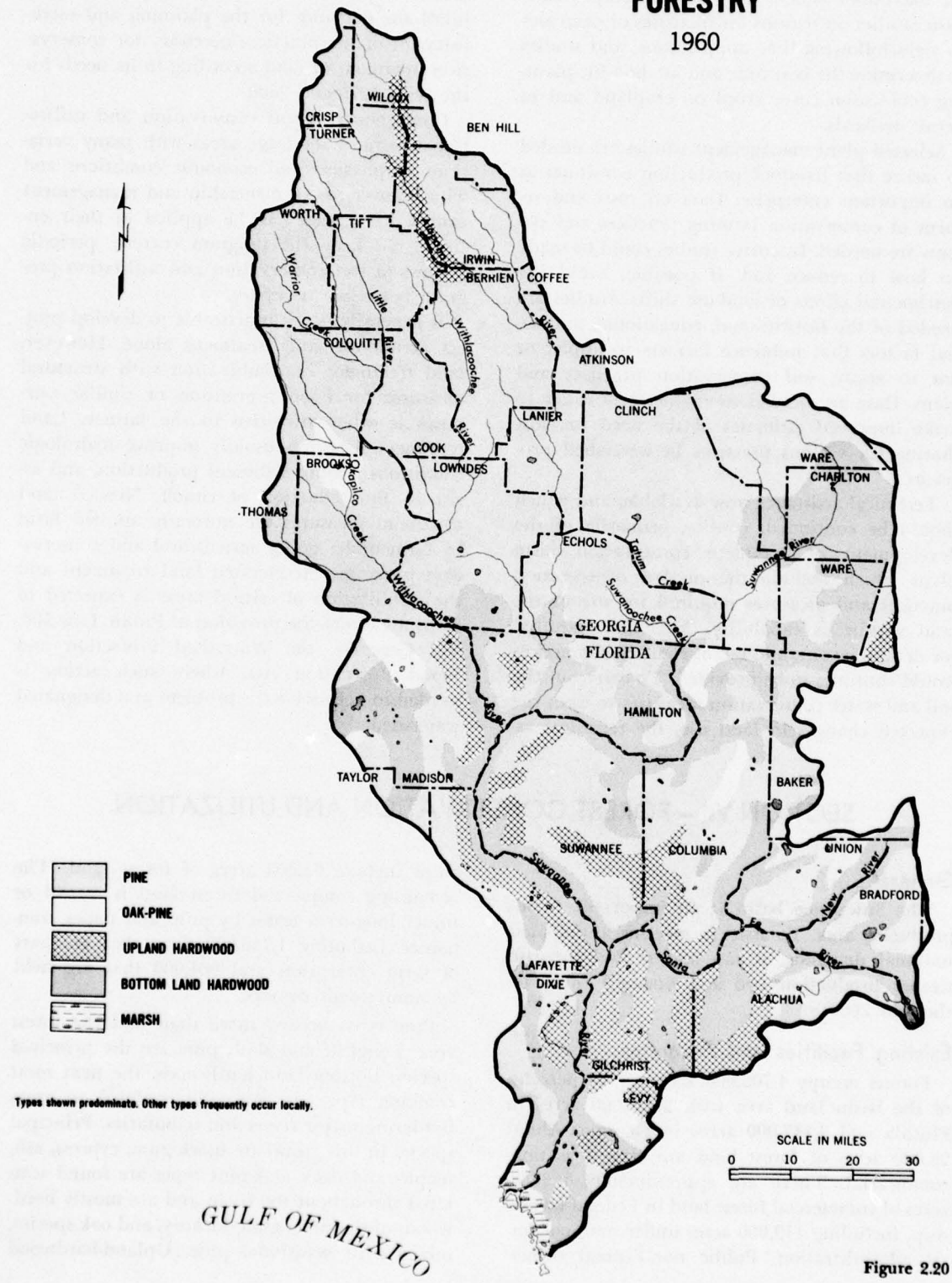


Figure 2.20

types are also scattered throughout the basin. Oaks and hickories are the predominant species in this group.

TABLE 2.6

Commercial Forest Acreage (thousands of acres)

Forest-type group	Georgia	Florida	Total
Pine	1,320	1,326	2,646
Oak-pine	98	98	196
Upland hardwoods	231	232	463
Bottom land hardwoods	686	689	1,375
Total	2,335	2,345	4,680

The commercial forest land contains 7,775 million board feet of sawtimber, of which 5,893 million board feet are softwoods. In terms of total merchantable timber, there are 1,942 million cubic feet of softwoods and 705 million cubic feet of hardwoods. Some 130 million cubic feet of growing stock were cut in 1959. Pulpwood was the major product harvested, followed by sawlogs. The remainder of the growing stock was cut into barrel staves and bolts, fuelwood, piling, posts, and ties. The stumpage value of the wood harvested in 1959 was about $13 million.

Less than 15 percent of the workable slash and longleaf pine trees are now being worked for gum-naval stores. However, as the supply of wood-naval stores is exhausted, gum will become a major source for meeting expected future demand. Anticipating this, all major producers of wood-naval stores have now entered into production of gum-naval stores.

Approximately 700 crops, of 10,000 faces each, of turpentine trees are being worked in the basin. The annual production is 192,500 barrels of crude gum.

Production of sulphate byproducts has increased considerably in recent years, but it is now approaching maximum output from the existing pulpmills. New mills, or additions to existing mills, will allow some increase in total production in the future.

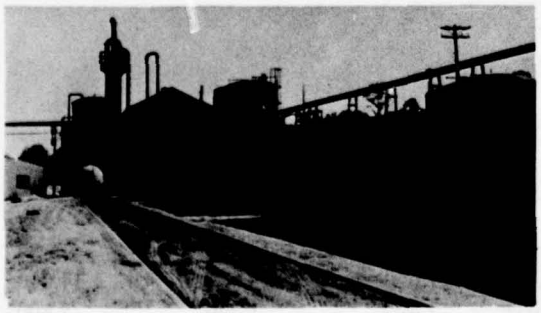


Figure 2.21 *Pole Treatment Plant, One of the Many Forest Industries.*

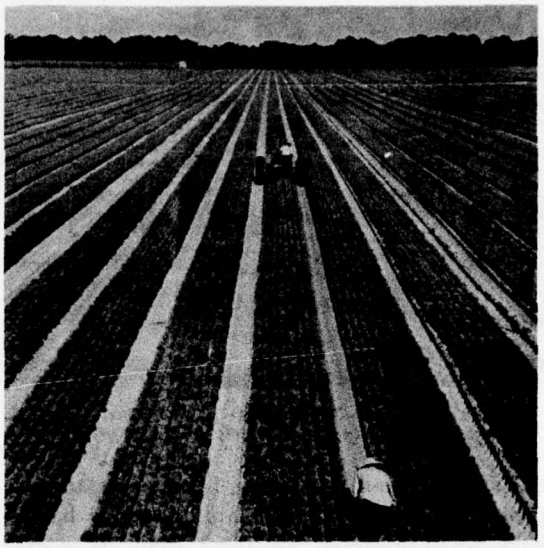


Figure 2.22 *Nurseries in the Basin Provide Seedlings for Reforestation.*

There are a number of active programs for improving forestry practices and yields in the basin. The States of Georgia and Florida are accelerating their programs for management assistance, and more landowners are being encouraged to improve their woodlands. In addition, both industry and consulting foresters are providing similar assistance.

Both public and private organizations support research relating to forest problems and needs of the basin. Included among the organizations are the Agricultural Experiment Stations, State forestry organizations, the U. S. Forest Service, the Georgia Forest Research Council at Macon, Georgia, various State colleges and universities, the wood-using industries, and several foundations. Protection, management, utilization, and genetic studies all receive emphasis.

Forestry educational programs are essential to the accomplishment of sound forestry programs. Major emphasis on educational activities is provided by the State forestry organizations through field personnel and by trained district and central office specialists.

All of the woodland, except the 199,000 acres

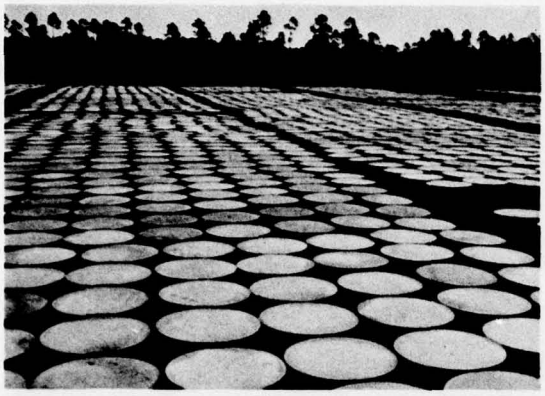


Figure 2.23 *Gum-Naval Stores Are Shipped from Suwannee Basin to All Parts of the World.*

in Lafayette County, Florida, is under organized protection. Most of the counties in the basin have been protected for more than 10 years. Georgia and Florida forestry organizations have done a remarkable job in reducing wildfire losses, but they are not fully staffed or equipped to cope with critical fire periods.

The tree-planting program in both States is proceeding at a rapid pace. More than 188 million tree seedlings have been planted in the Florida portion of the basin during the past 5 years. The Georgia Forestry Commission distributed more than 12 million seedlings in the Georgia portion of the basin during the 1959-1960 planting season.

The Naval Stores Conservation Program is administered by the U. S. Forest Service for the Agricultural Stabilization and Conservation Service. The Service provides conservation payments for carrying out certain approved forestry practices on the land. Of the 459 producers in the basin, some 392 are enlisted in the Naval Stores Conservation Program and work 6.77 million of the 7 million faces now treated for naval-stores production.

There have been no major epidemics of insects or diseases in the woodlands of the basin, although this is an ever-present danger. Field technicians of the State and Federal Forest Services help detect outbreaks and report them to responsible staff men for appropriate action.

Needs and Opportunities

The productive capacity of the projected forest acreage, if reasonably harnessed, can produce the estimated requirements for wood and gum-naval stores. In view of projected increases in population, income, and gross national product, it is estimated that, in the year 2000, approximately 305 million cubic feet of growing stock will be cut.

Gum-naval stores will eventually replace wood-naval stores and production will have to be doubled to obtain the needed output of naval-stores products for the year 2000.

The farm woodland acreage is expected to decline, while nonfarm acreage is expected to increase. Overall effect will be a small decline in total acreage.

Means of Meeting the Needs

A 2.5-fold increase in timber production and a doubling of gum-naval-stores production in the Suwannee basin by the year 2000 would be required to meet projected needs. Improved practices and coordinated individual and community efforts are essential to the production program.

On Federal lands, forest management and protection programs could be accelerated by installation of facilities, road building, planting, and

TABLE 2.7

Forest Production and Value

Item	Unit	Year		
		1959	1975	2000
Growing stock, annual cut	million cu. ft.	130	195	305
Stumpage value	million dollars*	13	20	30
Gum-naval stores	thousand faces	7,000	9,500	14,000
Net leasing value of naval stores	thousand dollars*	1,400	1,900	2,800

* 1960 dollar equivalent.

carrying out timber-stand improvement measures.

Measures needed for private lands include: Intensifying forest-fire protection for lands already under protection and including Lafayette County, Florida, in the organized protective network; strengthening forest insect and disease detection and control programs; building fence to control woodland grazing; tree planting; preparing sites for natural regeneration: thinning of commercial and noncommercial stands, where needed; establishing shelterbelts; installing woodland water control and management; employing improved naval-stores practices; establishing more adequate programs for forest credit and insurance; and expanding educational, research, and management assistance programs.

SECTION VIII – FISH AND WILDLIFE

General

Fish and wildlife resources of the Suwannee basin have contributed greatly toward meeting the needs for food, furs, and outdoor recreation of people residing within and without the basin. The relative importance of these uses has changed considerably since early colonial days when fur trade was a leading industry. Commercial fishing along the coast still provides a livelihood for some people, but the primary reason throughout the basin for fishing and hunting is for sport.

Existing Facilities and Programs

Wildlife and Sport Fisheries

In 1960, hunting and fishing afforded about 1.5 million user-days of outdoor recreation. The value to sportsmen was estimated to be around $3 million. A need for 123,000 user-days remained unsatisfied.

The land and waters of the basin are well adapted to a variety of wildlife. About 5.3 million acres considered suitable for big game vary from poor to excellent in quality. Nearly all of the predominantly forested land in Georgia and Florida and most of the sparse woodlands in Florida are occupied by white-tailed deer and wild turkey. American black bear thrive within and near Okefenokee Swamp. There are an estimated 14,000 big game animals in the basin or an average of one per 378 acres of suitable habitat.

Small game habitat totals approximately 6.9 million acres. The principal species in the uplands are bobwhite quail, mourning doves, squirrels, and rabbits. Rails are the principal game species of the coastal marshes.

Of the 460,000 acres of waterfowl habitat in the basin, about 13,000 acres are of high value. The coastal fresh-water marshes, the wooded flood plains, and the inland fresh-water marshes of the Okefenokee Swamp are most attractive. The 1960 midwinter inventory recorded 10,000 waterfowl, chiefly ducks.

The basin contains approximately 500 miles of sport fishing streams with a surface area of about 17,000 acres. Fish production depends, to a large extent, on the stage and duration of low flows and the extent of backwater flooding. The Suwannee River, which is fed from the Okefenokee Swamp and by springs in the central and lower reaches, affords some of the best sport fishing in the region.

There are many natural lakes in Florida and a few in Georgia, mostly in the limestone ridge sections. Two large reservoirs in Georgia are formed by the impoundment of inland swamps.

Figure 2.24 *White-Tailed Deer. Big Game Are an Important Attraction in the Basin.*

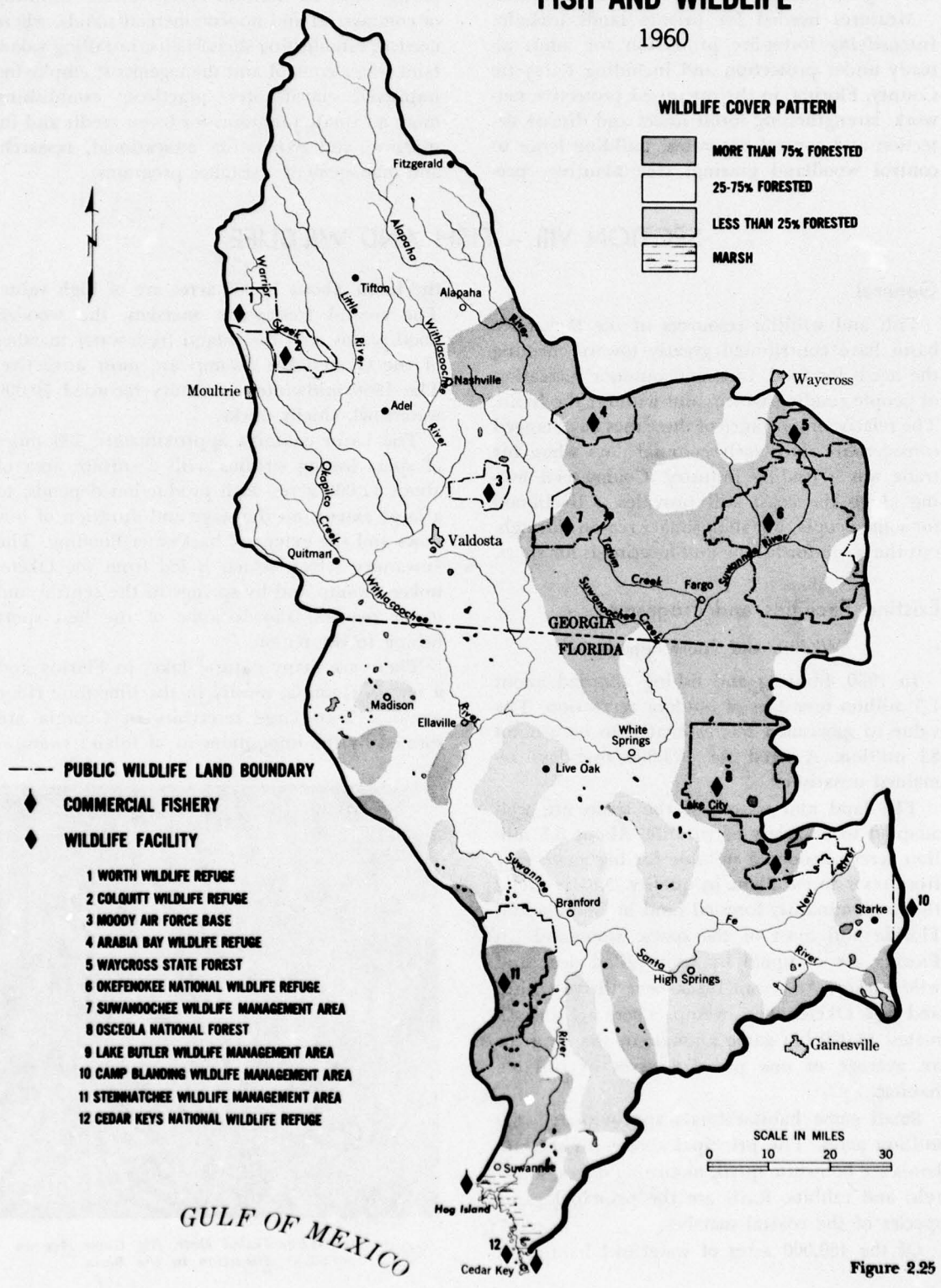

FISH AND WILDLIFE
1960
WILDLIFE COVER PATTERN
MORE THAN 75% FORESTED
25-75% FORESTED
LESS THAN 25% FORESTED
MARSH
PUBLIC WILDLIFE LAND BOUNDARY
COMMERCIAL FISHERY
WILDLIFE FACILITY
1 WORTH WILDLIFE REFUGE
2 COLQUITT WILDLIFE REFUGE
3 MOODY AIR FORCE BASE
4 ARABIA BAY WILDLIFE REFUGE
5 WAYCROSS STATE FOREST
6 OKEFENOKEE NATIONAL WILDLIFE REFUGE
7 SUWANDOCHEE WILDLIFE MANAGEMENT AREA
8 OSCEOLA NATIONAL FOREST
9 LAKE BUTLER WILDLIFE MANAGEMENT AREA
10 CAMP BLANDING WILDLIFE MANAGEMENT AREA
11 STEINHATCHEE WILDLIFE MANAGEMENT AREA
12 CEDAR KEYS NATIONAL WILDLIFE REFUGE
N
Fitzgerald
Alapaha
Tifton
Alapaha River
Warrior Creek
Little River
Withlacoochee River
Nashville
Moultrie
Adel
Waycross
Okapilco Creek
Valdosta
Quitman
Withlacoochee River
Suwannee River
Fargo
Suwannochee Creek
GEORGIA
FLORIDA
Madison
Ellaville
Suwannee River
White Springs
Live Oak
Lake City
New River
Branford
Starke
Santa Fe River
High Springs
Gainesville
Suwannee River
Hog Island
Cedar Key
GULF OF MEXICO
SCALE IN MILES
0 10 20 30

Figure 2.25

There are many small impoundments, consisting of natural and artificial ponds and lime sinks of less than 40 acres. All of these impoundments are utilized for sport fishing.

Principal fresh-water sport fish include largemouth bass, Suwannee bass, bluegills, crappies and other sunfish, catfish, and pickerels. Salt-water species may also be taken along the lower reaches of the Suwannee River.

The irregular 29-mile Suwannee area coastline has many bays, lagoons, and salt-water creeks. A large area of protected water lies inside the hundreds of near-shore and offshore islands or bays. Suwannee Reef, extending from a few miles north of Cedar Key northwestward to the basin boundary, forms Suwannee Sound.

The surface area of the inshore waters totals about 38,000 acres. Extending the basin boundaries seaward for 12 miles, the recognized limit of nearly all fishing activity, gives it an offshore area of some 196,000 acres.

Principal fish taken inshore include the speckled sea trout, flounders, redfish, sheepshead, sand trout, silver perch, pompano, and mangrove snapper. Offshore, the principal species include grouper, Spanish mackerel, king mackerel, bluefish, and cobia.

Commercial Fisheries

Commercial fishing is an important coastal enterprise. The yearly average commercial catch from 1955 to 1959 was 1.7 million pounds valued at $113,000. The principal seafoods are blue and stone crabs, which are processed locally and distributed to markets throughout the eastern United States. The harvest of crabs has increased rapidly. Mullet and spotted sea trout are the most important finfish. The catch of these species is augmented by bluefish, redfish, groupers, spot, pompano, grunts, and flounders.

Shore establishments consist of one crab-processing plant and five wholesale-retail fish houses in Cedar Key and two wholesale-retail fish houses in the town of Suwannee.

TABLE 2.8

Fresh-Water Fish and Wildlife Areas and Installations
(thousands of acres)

Name of area	Location	Acreage in basin	Present ownership acreage in basin		
			Public		Private
			Federal	Non-Federal	
Federally administered					
Okefenokee National Wildlife Refuge	Ga.	331	331	0	0
Moody Air Force Base	Ga.	9	9	0	0
Osceola National Forest	Fla.	119	119	0	0
Camp Blanding	Fla.	2	2	0	0
Cedar Keys National Wildlife Refuge	Fla.	*	*	0	0
Subtotal		461	461	0	0
State administered					
Waycross State Forest	Ga.	18	0	18	0
Arabia Bay Wildlife Management Area	Ga.	42	0	0	42
Suwanoochee Wildlife Management Area	Ga.	55	0	0	55
Osceola Wildlife Management Area	Fla.	(Acreage included in Osceola National Forest above)			
Lake Butler Wildlife Management Area	Fla.	65	0	0	65
Steinhatchee Wildlife Management Area	Fla.	112	0	0	112
Camp Blanding Wildlife Management Area	Fla.	(Acreage included in Camp Blanding above)			
Subtotal		292	0	18	274
Locally administered					
Worth County	Ga.	38	0	0	38
Colquitt County	Ga.	25	0	0	25
Subtotal		63	0	0	63
Total		816	461	18	337

* Less than 1,000 acres.

Needs and Opportunities

Wildlife and Sport Fisheries

By 2000, the user-days of hunting and fishing are expected to increase to 3.2 million or to over two times the level of use in 1960.

Per capita demand for hunting and fishing decreases as urbanization increases. This was readily apparent in comparative studies of hunting and fishing license sales in urbanized and rural counties of the Southeast.

A further decrease in rural population of the basin is expected, but the urban population, including that of nearby out-of-basin population centers, will expand rapidly. Hunting and fishing needs will also be influenced by the out-of-basin demand originating for the most part in Georgia. The net effect will result in a significant increase in hunting and fishing demand in spite of an expected decline in per capita demand.

Analysis of needs for hunting and fishing opportunity in relation to resource trends and development opportunities led to the establishment of goals which place greater emphasis on big game production and utilization in the future. While the numbers of big game are currently less than desired, the habitat is capable of sustaining more than enough white-tailed deer to meet the projected demand.

Small game resources are expected to continue to support the majority of the hunting effort. No deficit in the number of small game is evident over the basin as a whole. However, the availability of small game on lands open to public hunting will become critical.

Figure 2.26 *Suwannee River Bass. The Basin Provides an Excellent Sport Fishery.*

Little increase in waterfowl hunting is projected because of the scarcity of wild ducks and geese. In the future, it is probable that, in the Suwannee basin, more emphasis will be placed on developing and protecting waterfowl for observation and esthetic values than for hunting purposes.

An analysis of demands for sport fishing in relation to resource trends led to the establish-

TABLE 2.9

Wildlife Needs and Supply (thousands)

Year	Type of resource	Needs	Supply		Deficit
		User-days	Acres of habitat	User-days capacity*	User-days capacity
1960	Big game	173	5,298	70	103
	Small game	353	6,965	883	0
	Waterfowl	16	460	5	11
1975	Big game	183	5,298	105	78
	Small game	456	6,965	883	0
	Waterfowl	23	460	5	18
2000	Big game	244	5,298	130	114
	Small game	600	6,965	883	0
	Waterfowl	24	460	5	19

* Based on existing and prospective numbers of game animals with normal expansion of going programs.

TABLE 2.10

Sport Fishing Needs and Supply
(thousands)

Year	Type of resource	Needs	Supply		Deficit
		User-days	Acres of habitat	User-days capacity*	User-days capacity
1960	Streams	124	17	255	0
	Large impoundments	422	57	570	0
	Small impoundments	409	16	400	9
	Salt water	78	234	598	0
1975	Streams	190	17	255	0
	Large impoundments	659	57	570	89
	Small impoundments	679	21	525	154
	Salt water	103	234	598	0
2000	Streams	280	17	255	25
	Large impoundments	963	57	570	393
	Small impoundments	934	32	700	234
	Salt water	174	234	598	0

* Based on existing and prospective standing crops of harvestable size game fish with normal expansion of going programs.

ment of requirements for an increase in the user-days capacity of all types of fresh water. In 1960, 12 percent of the fishing pressure was on streams, 40 percent on large impoundments, 40 percent on small impoundments, and 8 percent on salt water. If this distribution prevails in 2000, the estimated deficit in terms of user-day capacity would run from 25,000 in streams to 393,000 in large impoundments. There is much opportunity, however, to overcome these deficits either by increasing fish production in existing waters, by the creation of additional impoundments, or by a combination of the two.

Salt-water fishing along the basin coast is highly regarded by many fishing enthusiasts, most of whom are from outside the basin. Many individuals return year after year to the same water and shore facilities. Total utilization, however, is slight in comparison with resource supply.

Commercial Fisheries

The share of the Nation needs for food fish in 2000 which might reasonably be allocated to Suwannee basin is approximately 3.7 million pounds or 2.1 times the average annual catch from 1955-59.

Production in the United States declined after 1950 while food fish imports increased. Factors responsible for decline in domestic fish production are fluctuations in supply, increased costs, competition from other animal protein foods and from fishery products abroad, and lack of information about the sea and its resources. The annual per capita consumption of about 11 pounds, edible weight, of food fish has remained constant.

The demand for quality seafood, however, is high and is expected to continue in the future. To meet this demand it is feasible to augment natural production of shrimp, oysters, and certain finfishes by cultural programs. As for other fishes, there seems to be ample supplies and a potential market if food products can be produced that will meet with wide public accept-

TABLE 2.11

Commercial Catch Requirements
(thousands of pounds)

Resource	1960*	1975	2000
Crabs	1,188	1,356	2,024
Oysters	0	35	35
Shrimp	0	42	42
Selected finfishes	562	644	863
Other fishes	0	193	716
Total	1,750	2,270	3,680

* Based on the average annual catch from 1955-59.

ance. Thus, it was assumed that domestic production in the future will keep pace with the population growth of the Nation.

Means of Meeting the Needs

Wildlife and Sport Fisheries

With more intensive management of fish and wildlife and their habitat, the Suwannee basin demand for hunting and fishing for food and sport can be met. Some adjustment in wildlife and fish inventories and in the relative pressures exerted on each resource will have to be made in recognition of resource trends and development opportunities.

Use of publicly owned and managed areas is expected to continue to increase at a rate greater than the general increase in population and overall hunting and fishing effort. This reflects the impact of urbanization. Closure of more private lands to public access is expected to make it increasingly difficult for the urbanite to find a place to hunt, despite increases in travel, leisure time, and personal income.

Big game development affords one of the more promising ways to meet the future demand for hunting. With more extensive management the habitat is capable of readily supplying the anticipated big game demand plus a considerable amount of unsatisfied demand for small game and waterfowl hunting. The general trend of agricultural land use favors big game enhancement, but some loss of habitat is expected through urban and industrial development. Current forestry practices involving destruction of hardwoods, planting of solid pine stands, and draining and clearing mixed forest land tend to reduce the available habitat. Future emphasis on hardwood production, however, is expected to be of value for game management.

Meeting the anticipated demand for 49,000 head of big game by 2000 would require that all habitat now occupied by deer and turkey be managed extensively to increase existing populations. This would necessitate increased production of big game to attain an average density of 108 acres of suitable habitat per animal.

The nucleus of any program would be new and improved management areas. Industrial tree farmers would play an important role by continuing their demonstrated interest in developing the wildlife resources on their land. A coordinated approach to timber-wildlife management, like programs now in effect within national forests and on existing State-private wildlife management areas, may be attained on these tree farms.

The task of developing small game resources to meet the demand lies primarily with agricultural landowners. Bobwhite quail and mourning doves, the most popular game species in the basin, are largely the product of the type and pattern of land use. Major requirements for wildlife habitat improvement can be met by prescribed burning, roadside planting, and food and cover strip planting.

Meeting the demand for waterfowl hunting is not a problem which can be effectively achieved solely by more intensive management within the basin, although this will be of some value. Basically, this is a problem of supply that originates far from the borders of the basin. The duck population trend in the Atlantic Flyway, after remaining essentially static for several years, is again declining. The waterfowl value of the Suwannee basin wetlands, however, can be enhanced by programs to preserve and develop existing wetlands; to increase the attractiveness of the habitat; and by a program to increase production of resident species.

A balanced program of stream and lake improvement and development is needed to meet present and future fishing needs.

If the present trend in farm-pond construction continues, more than enough fish could be produced in small impoundments to sustain the demand for this type of fishing. An expansion of the current fisheries program, however, will be needed to service these and other impoundments and thereby increase the acreage which affords quality fishing.

There is a marked deficit in the acreage and production capacity of large impoundments in the Georgia portion of the basin. Field surveys have revealed numerous sites well adapted to the construction of new reservoirs. These reservoirs would satisfy the need for this type of fishing, if developed primarily for this or multiple-purpose use. A minimum of 39,300 additional acres of large impoundments, with management at the present level, would be required to produce the weight of fish necessary to meet

the anticipated fishing demand. With high-level management, a minimum of 5,200 additional acres of large impoundments established for sport fishing would suffice.

A deficit in the supply and availability of sport fish in the streams is also anticipated. New streams to satisfy increasing demands for fishing cannot ordinarily be created conveniently or economically. Therefore, management to meet the demand for stream fishing depends largely upon improvement of the existing habitat and the development of facilities and public access to the streams.

Realization of the full potentials of the streams would require flow regulation to increase their productivity. The period when conditions are favorable for sport fishing can be extended, while permitting necessary fluctuation for best fish production and harvest.

To preserve and increase the public's fishing opportunity, existing programs of access development require major expansion. As many as 167 additional access points with permanent boat-launching ramps and parking areas would be required on existing lakes and streams. Camping facilities at a number of these sites would increase their utility.

The capacity of the salt-water fish resources to satisfy the projected demand is limited more by the number and type of facilities for fishing than by the extent and productivity of the habitat. The inshore waters of the basin are apparently capable of maintaining their present high productivity indefinitely if dredging and filling operations are held to a minimum.

At present, there are only two centers of salt-water sport fishing. One is Suwannee, a small settlement near the mouth of the Suwannee River; and the other is Cedar Key, a picturesque village on a white sand island some 14 miles down the coast. Existing accommodations range from primitive to contemporary and help to create a unique setting.

Features to preserve this unusual setting and still enhance the value of the sport fishing should be developed. Needed developments include transient housing at Cedar Key, new fishing camps at Suwannee, catwalks on bridges to Cedar Key, additional access points and boat launching facilities to the Gulf of Mexico, group fishing accommodations, provision of large party boats from Suwannee, and improved water approaches, including the channel to Suwannee.

Commercial Fisheries

The crab fishery offers the most favorable opportunity for meeting commercial catch requirements. There is an abundance of crabs in the coastal waters of the Suwannee basin, and there has been a steadily growing market for crab products. Crab landings have risen sharply during the past 10 years, and the outlook for continued increased catches is good.

There are suitable sites for oyster cultivation, but incentives are lacking. The fishing industry generally and the oyster industry specifically are plagued by the vagaries of weather, precarious market conditions, and by the lack of widespread adoption of good conservation practices. It is conceivable that, as the Nation population increases and more food supplies are needed, there will be a return to the sea as a major source of food and employment. Meanwhile, it is very doubtful that many able and energetic young men will attempt to develop the commercial fishery potentials of the Suwannee basin unless the economic feasibility of such a venture can be demonstrated.

The commercial fishery outlook of the Suwannee, as well as that of other Southeast River Basins, could be greatly improved by applying the findings of new studies aimed at determining the most economical methods of catching, handling, processing, and marketing mullet, spotted sea trout, other finfish, and shellfish, and at developing practical marine shellfish farms for oysters, shrimp, hardshell clams, and crabs.

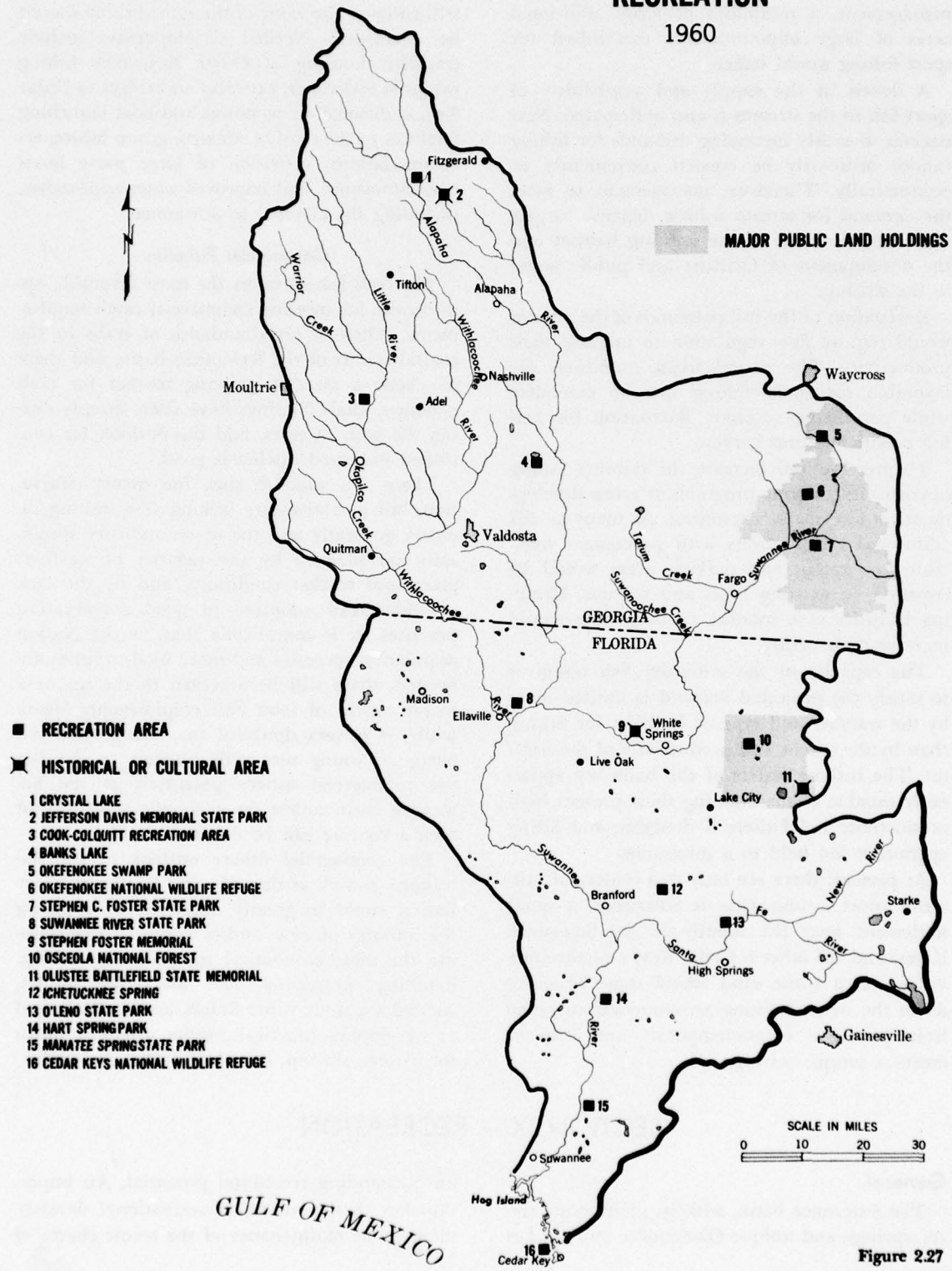
SECTION IX – RECREATION

General

The Suwannee basin, with its picturesque rivers, springs, and unique Okefenokee Swamp, has an outstanding recreation potential. An important key to the success of recreational development is the maintenance of the scenic charm of

RECREATION

1960



■ RECREATION AREA

✕ HISTORICAL OR CULTURAL AREA

1 CRYSTAL LAKE
2 JEFFERSON DAVIS MEMORIAL STATE PARK
3 COOK-COLQUITT RECREATION AREA
4 BANKS LAKE
5 OKEFENOKEE SWAMP PARK
6 OKEFENOKEE NATIONAL WILDLIFE REFUGE
7 STEPHEN C. FOSTER STATE PARK
8 SUWANNEE RIVER STATE PARK
9 STEPHEN FOSTER MEMORIAL
10 OSCEOLA NATIONAL FOREST
11 OLUSTEE BATTLEFIELD STATE MEMORIAL
12 ICHETUCKNEE SPRING
13 O'LENO STATE PARK
14 HART SPRING PARK
15 MANATEE SPRINGS STATE PARK
16 CEDAR KEYS NATIONAL WILDLIFE REFUGE

Figure 2.27

the area by proper design of needed developments. Future demands for recreation opportunity in the basin are expected to be well in excess of those needs generated locally.

Existing Facilities and Programs

In 1959, visitation at public recreation areas within the Suwannee basin totaled about 700,000 user-days. It is estimated that these facilities would be adequate for over a million user-days per year. Some areas are not sufficiently utilized, and others are over-utilized.

Crystal Lake near Irwinville, Georgia, is a 20-acre springfed lake ringed with a superb, wide beach of native white sand. A small campground is provided in the woods close to the beach. No boats are permitted on the lake. A new bathhouse and pavilion and flood lights on the beach provide excellent facilities for visitors. This facility is operated by a local corporation and has a resident caretaker. Use of the area for swimming, picnicking, and camping could be increased considerably.

Jefferson Davis Memorial State Park is located about 10 miles southwest of Fitzgerald, Georgia, and contains about 13 acres. It has an attractive museum and picnic ground featuring the site of the Confederate President's capture by Union troops.

Cook-Colquitt Recreation Area with 1,500 acres contains a lake and recreation development constructed by the State of Georgia and administered by Cook and Colquitt Counties. It is located on Little River between Moultrie and Adel.

Banks Lake is an existing 10,000-acre swampy reservoir located about a mile west of Lakeland, Georgia. It was privately developed for fishing and other uses. Boats are rented by a concessionaire. Cypress trees stand out in the lake a good way from shore. It is conceivable that a beach could be developed when pressure for recreation makes it necessary. Fishing and boating possibilities are almost unlimited. A part of the lake is federally owned.

Okefenokee Swamp Park, adjacent to the northeast part of Okefenokee Swamp, is a private development operating under a long-term lease from the Fish and Wildlife Service. The natural features of the Okefenokee Swamp are

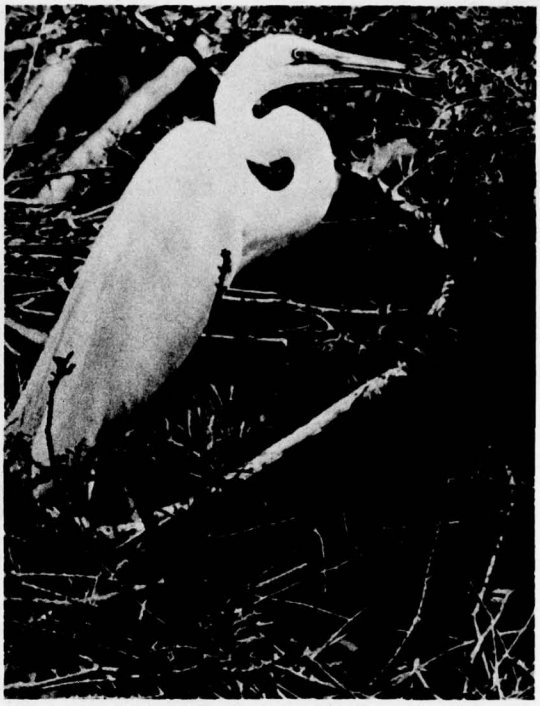


Figure 2.28 *American Egret in Okefenokee National Wildlife Refuge.*

exhibited by interpretive walks, boat rides, wildlife displays, and other features.

Okefenokee National Wildlife Refuge includes 331,000 acres in Okefenokee Swamp administered by the U. S. Fish and Wildlife Service. Fishing accounts for the bulk of the refuge use, but sightseeing is popular because of the swamps unique character and the abundance of wildlife and flora it contains.

The Stephen C. Foster State Park is an 80-acre area located northeast of Fargo, Georgia, on the western edge of Okefenokee Swamp. It is operated by the Georgia State Park Department. Cabins, boats, and fishing supplies are provided.

Suwannee River State Park is located at the intersection of the Suwannee River and U. S. Highway No. 90 in Suwannee County, Florida. Only about 50 acres of the park have been developed, with facilities for camping, hiking, boating, and sightseeing. Remnants of a Civil War battlefield and other items of historical significance exist within the park boundaries.

Stephen Foster Memorial near White Springs, Florida, contains a museum, a bell tower, a drive, and has boat-ride facilities. It is operated

Figure 2.29 *Stephen Foster Memorial. Attractive Facilities Are Being Expanded.*

by a State commission. Memorabilia of Stephen C. Foster are featured in the museum.

Osceola National Forest in Baker and Columbia Counties, Florida, contains areas set aside for boating, swimming, and camping. Ocean Pond provides a major recreation area within the forest boundaries.

Olustee Battlefield State Memorial, a small historic site, along U. S. Highway No. 90, commemorates a bloody Civil War engagement.

Ichetucknee Spring near Fort White, in Columbia County, Florida, has swimming accommodations, but other facilities are meager. The spring flow averages about 150,000 gallons per minute in an attractive natural setting and provides the major source of water for the Ichetucknee River, a short tributary of the Santa Fe River.

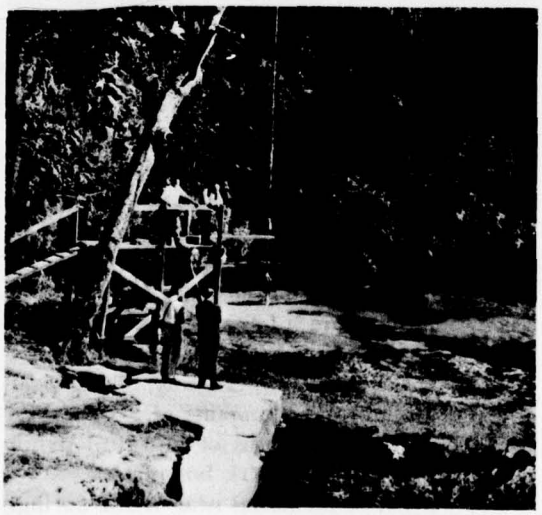


Figure 2.30 *Ichetucknee Spring, an Undeveloped Beauty Spot.*

O'Leno State Park with 1,427 acres is located on the Santa Fe River at a point where the stream goes underground during normal and low-flow stages. Facilities are provided for group camping, nature study, swimming, and hiking.

Hart Spring Park is a county development at the end of State Route No. 344 in Gilchrist County, Florida, with facilities for swimming, boating, fishing, and picnicking. About 28,000 gallons a minute pour from the spring.

Manatee Spring State Park is located along the Suwannee River in Levy County, Florida. The 1,798-acre area has attractive facilities for swimming, boat launching, camping, hiking, and picnicking.

The Cedar Keys Wildlife Refuge includes 379 acres of keys in the Gulf of Mexico near the city of Cedar Key. The area is used primarily as a bird habitat.

Needs and Opportunities

In estimating future demands for public outdoor recreation, it was assumed that approximately one-fifth of the leisure days available to the people of the basin would involve some type of public outdoor recreation. It was also assumed that residents of the Southeast River Basins who leave the area for recreation are balanced by nonresidents who come into the area for recreation. Distribution of the Southeast River Basins area demands to individual basins, however, was based on the relative significance of recreation opportunities, the population concentrations within and adjacent to the basin, and other related factors. These studies indicated a need by the year 2000 of 9.4 million user-days for people now in the basin and those expected to settle in the basin to take advantage of the recreational opportunities. There is an additional need to provide for 5.6 million user-days for nonresidents who would come to the basin to recreate or who would use recreational facilities while passing through the basin.

TABLE 2.12

Recreation User-Days — 1960, 1975, and 2000 (thousands)

Area	1960	Projected need	
		1975	2000
Suwannee basin	1,100	6,200	15,000
Southeast River Basins	35,000	95,000	230,000

In addition to the several recreational resources of national reputation, notably Okefenokee Swamp and the Suwannee River, the basin has a native beauty and the resources around which almost unlimited recreational opportunity can be developed. The basin lies athwart major transportation routes to Florida, and two new interstate highways intersect in its south-central portion. Many people pass through it, especially in the winter, in their search for sunshine and warmth. As the national population, wealth, and opportunity for travel increases and more and more urban residents begin to seek opportunity, the Suwannee basin can utilize its resources to fit into and capitalize on this national trend. More students of history and nature, more boaters, and more vacationists will seek out and use whatever opportunities are available for enjoying and understanding their country and its varied resources. Many areas in the Suwannee will help meet both national and regional needs.

Means of Meeting the Needs

Several existing recreation areas are expected to absorb greater visitation without any significant development. Cedar Keys National Wildlife Refuge contains much of interest to the biologist and the study of nature. Since its primary purpose is to protect wildlife, careful development will be needed to fit the varied interests in with its present use.

Figure 2.31 *Manatee Spring State Park.*

Most of the Okefenokee Swamp lies within the bounds of the national wildlife refuge administered by the Fish and Wildlife Service of the Department of Interior. Commercial exhibits adjacent to the refuge interpret and show the main biotic features to the public. The Stephen C. Foster State Park, leased to the State of Georgia by the Fish and Wildlife Service, affords limited opportunity to the public, mainly for fishermen. The Okefenokee Swamp itself is a unique natural area, one of the last areas of its kind remaining in the United States. It contains cypress, alligators, egrets, and mammals and has an abundance of other things of natural interest. As the needs increase, such a natural area will feel the encroaching pressures of civilization even though its primary purpose as a refuge is maintained. Improper development would only destroy the very things which make the swamp what it is. However, its unusual natural history,

TABLE 2.13

Recreation Facility Needs (thousands of user-days)

Facilities	1960	Increase 1960-1975	Increase 1975-2000	2000
Enlarging existing areas	1,076	724	3,360	5,160
New areas	—	4,400	5,440	9,840
Total	1,076	5,124	8,800	15,000

geology, and biota afford a superb opportunity for effective interpretation. The area offers unique attractions and educational values to the amateur and professional naturalist. A properly planned interpretive center could provide tremendous values without impairing the area.

The Osceola National Forest has a large development at Ocean Pond for 150,000 users each year, and its use could be expanded.

Other areas which are already partially developed for recreation can help meet the future needs for greater opportunity.

About two-thirds of the recreation demand expected by 2000 can best be met by the development of new areas and facilities. These could include large fresh-water impoundments, small watershed developments where adaptable, a salt-water beach area, and appropriate facilities along Suwannee River, interconnected by a convenient road system.

In addition, access to water areas should be provided throughout the basin, but particularly along the Suwannee River and its main tributaries and at small watershed impoundments where public access is permitted. The areas would vary in size to meet local conditions. Some would be little more than a local recreation area, others would be regional in use and opportunity. Their value depends largely upon the availability of a constant water supply of acceptable quality.

The remainder of the indicated demand could be satisfied by developing the unusual spring areas in the southern portion of the basin. These unique springs, with their clear water and unusual sites, offer many attractions to the recreationist. Proper development of these spring areas would not only provide opportunity for meeting local needs but would also enhance the opportunities for nonresidents.

By the year 2000, recreational facilities are expected to require about 25,000 acres of land, or about quadruple the amount now devoted to such use.

SECTION X – SALINITY AND SEDIMENT CONTROL

General

Salinity problems exist in the soil when enough salt accumulates to impair crop productivity. They occur in water supplies when salt water intrudes fresh-water areas so as to interfere with water use or availability. Sediment problems result when water transports silt, sand, pebbles, and other matter and deposits its load in reservoirs, ditches, channels, and other areas where sediment is objectionable. These problems are localized in the Suwannee basin.

Figure 2.32 *Vegetative Treatment Combines Erosion Control and Roadside Beautification.*

Existing Facilities and Programs

There are no existing programs specifically for sediment or salinity control. The soil and water conservation program includes features which control erosion and hence reduce sediment loads. Interest has been expressed in project-type actions, primarily for flood prevention and drainage, of which an incidental effect would be the control of sediment. Urban expansion and development should result in greatly reduced rates of erosion and sediment production from land converted to these uses. The Cedar Key water supply is subject to salt water intrusion during extended periods of heavy pumping of the city's 17 shallow wells.

Needs and Opportunities

Both sheet erosion, which affects wide areas, and channel erosion, which occurs in gullies, roadbanks, and streams, are problems in the basin. In terms of total volume, sediment originating from sheet erosion is greater, although sediment produced from other sources may be more per unit area and occurs in higher concentration.

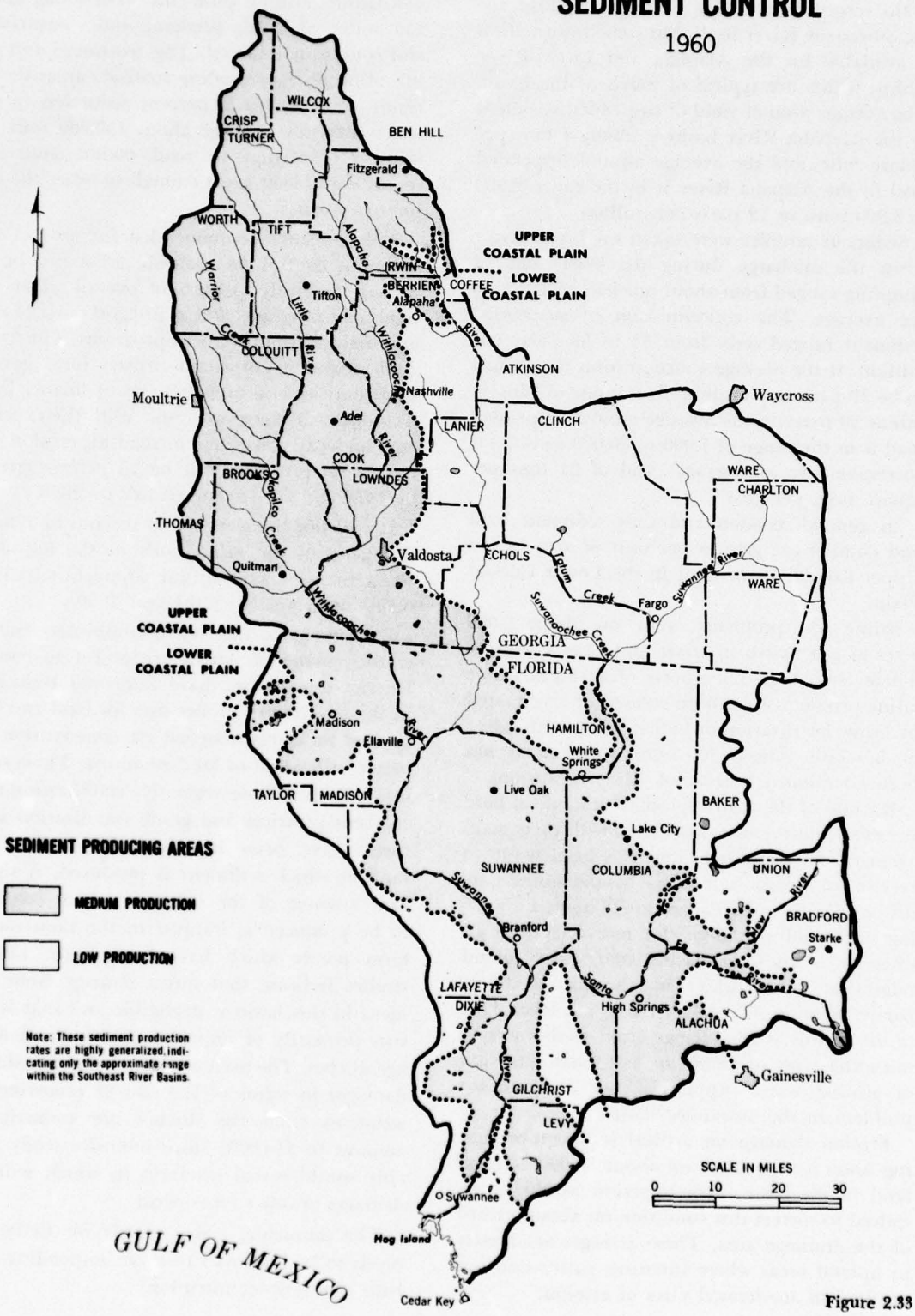

SEDIMENT CONTROL
1960
WILCOX
CRISP
TURNER
BEN HILL
Fitzgerald
WORTH
TIFT
Alapaha
IRWIN
BERRIEN
COFFEE
Alapaha
UPPER
COASTAL PLAIN
LOWER
COASTAL PLAIN
Warrior
Little
Creek
Tifton
COLQUITT
River
Withlacoochee
River
ATKINSON
Moultrie
Nashville
Waycross
Adel
LANIER
CLINCH
River
COOK
LOWNDES
WARE
CHARLTON
BROOKS
Okapilco Creek
THOMAS
Quitman
Valdosta
ECHOLS
Iglum
Creek
Suwannee River
Fargo
WARE
Withlacoochee
Suwanoochee Creek
UPPER
COASTAL PLAIN
LOWER
COASTAL PLAIN
GEORGIA
FLORIDA
Madison
Ellaville
River
HAMILTON
White
Springs
TAYLOR
MADISON
Live Oak
BAKER
Lake City
SUWANNEE
COLUMBIA
UNION
Suwannee
River
BRADFORD
Starke
Branford
Santa Fe
River
LAFAYETTE
DIXIE
Santa
Fe
River
High Springs
ALACHUA
Gainesville
GILCHRIST
LEVY
Suwannee
Hog Island
Cedar Key
GULF OF MEXICO
SEDIMENT PRODUCING AREAS
MEDIUM PRODUCTION
LOW PRODUCTION
Note: These sediment production rates are highly generalized, indicating only the approximate range within the Southeast River Basins.
SCALE IN MILES
0
10
20
30

Figure 2.33

No record is available of sediment load for the Suwannee River itself, but some information is available for the Alapaha and Little River basins, which are typical of much of the basin. The average annual yield of suspended sediment in the Alapaha River basin is about 8 tons per square mile, and the average annual suspended load in the Alapaha River is in the range 2,500 to 8,000 tons, or 12 parts per million.

Sediment samples were taken on Little River when the discharge during the brief time of sampling ranged from about one-half to 18 times the average. The concentration of suspended sediment ranged only from 13 to 59 parts per million. If the average concentration is assumed to be 30 parts per million, in a range of plus or minus 50 percent, the average annual suspended load is in the range of 7,000 to 20,000 tons. This corresponds to an average yield of 24 tons per square mile per year.

In general, erosion and thus sediment load and damage are greater per unit of area in the Upper Coastal Plain than in the Lower Coastal Plain.

Saline soil problems occur on about 6,000 acres of salt marsh in Dixie and Levy Counties. There have been no reports of acreages where saline problems have been created or accelerated by heavy fertilization or by irrigation with saline or brackish waters. No agricultural land has been abandoned because of saline conditions.

Because of the relatively small amount of land involved and the costs associated with their management, no concerted effort has been made to reclaim or rehabilitate areas having saline conditions. Saline soil areas are used largely for grazing cattle and as habitats for native wildlife. In some areas an insignificant amount of inland migration of salt-water marshes is occurring, partly because of a slowly rising sea level. One result of this is the change from fresh-water to salt-water types of plant life. Salt-water intrusion of ground water supplies is not a significant problem in the Suwannee basin.

Erosion damage on critical sediment-producing areas is a problem on about 60,000 acres of land in the basin. Project action would be required to correct this condition on about a third of the drainage area. These acreages are mostly in upland areas where intensive cultivation has resulted in accelerated rates of erosion.

Roadside erosion problems occur along about 250 miles of road, predominantly unsurfaced and county maintained. The treatment and stabilization of these eroding roadside areas should result in at least a 90-percent reduction in soil losses that now average about 150,000 tons per mile. The savings in road maintenance cost should be at least great enough to offset the cost for treatment.

The measures recommended for erosion and sediment control on roadside areas can be installed effectively as parts of overall watershed-treatment programs and as integral parts of road and highway improvement programs. The watershed treatment approach utilizes local government entities and other sources of financial and technical assistance programs. With the expected new highway construction, roadside-erosion control needs probably will be 15 percent greater by 1975 and 25 percent greater by 2000.

It will not be necessary to reclaim or rehabilitate any of the saline soils in the Suwannee basin to meet agricultural production requirements until well after the year 2000.

During the past 20 years, landowners and operators, many of whom are Soil Conservation District cooperators, have improved techniques in the selection of proper uses for land and have applied measures designed for conservation and better utilization of land resources. These measures, which include vegetative stabilization management practices and grade stabilization structures, have been instrumental in decreasing rates at which sediment is produced. A significant amount of the sediment which continues to be produced is trapped in the thousands of farm ponds which have been built. Limited studies indicate that direct damage from sediment in this basin is negligible and that it consists primarily of impaired usefulness of drainage ditches. The present average annual sediment damages in terms of the cost of removing this sediment from the ditches are estimated to amount to $10,000. More intensive study probably would reveal instances in which sediment damages of other types occur.

The municipal water supply for Cedar Key needs to be improved to avoid impending problems of salt-water intrusion.

Means of Meeting the Needs

Under existing, authorized, or proposed programs, most sediment control will occur as incidental effects of programs initiated primarily for other purposes.

Overall watershed-treatment programs, which often include impoundment-type structures, will provide the most effective means of establishing sediment control. Such programs would include land-treatment measures on land requiring project action for erosion-damage reduction. The existing nonproject soil and water conservation programs offer the best means for reducing erosion on other lands in the basin.

The water supply for Cedar Key could be improved by development of an adequate supply on the mainland and the construction of a pipeline to the town.

SECTION XI – POLLUTION ABATEMENT AND PUBLIC HEALTH

General

Public health is an important factor in the development of resources. Economic growth is retarded when poor health causes a loss in production and necessitates high expenditures for personal medical attention. Programs in this field are concerned with improving the health, safety, and welfare of the entire population.

Only those phases of public health directly related to land and water resources development are included in this study. Items discussed in this Section include: The abatement of water and air pollution, radiation monitoring, the collection and disposal of community and industrial solid waste, and vector control. The development and protection of potable water supplies, as discussed in Section II, are also an important part of the public health program. Other public health related items are included in the appropriate sections of the Report. The basic objective of all these phases of public health is the protection of the community health through the control of man's environment. Establishing an adequate, coordinated, public health program is essential for optimum utilization of the land and water resources of the basin.

Existing Facilities and Programs

Pollution Abatement

Pollution exists, to some degree, in many Suwannee basin streams. The impact of pollution on the economy of the basin has not been evaluated in detail. However, periodic fish kills have been reported, and the use of a few polluted stretches of streams for aquatic sports has been prohibited. The ground water supply of one town was polluted by the discharge of waste to drainage wells until this situation was corrected. There is a need to provide more waste-treatment facilities to prevent pollution of the streams and maintain high quality water.

An inventory was made of the 1960 municipal and industrial water uses. Waste discharge was assumed equal to the water use since there were no facilities available for measuring the flows. Data were obtained for 25 towns in the basin with a combined 1960 population of 126,845 and three systems serving an additional 6,300 people at a State institution, an air base, and an aviation school. These sewerage systems served about 113,000 people and received some industrial wastes. Three towns provided no treatment. At the time of the survey, industrial wastes discharged to the municipal systems increased the strength of the sewage to a total population equivalent of 147,000 people. Twenty-eight industries in the basin discharge their wastes directly to streams. Of the 28, only 9 provided treatment and some of these did little to reduce the amount of pollution.

Observations below waste-discharge points and reports of stream conditions indicate unsatisfactory handling of waste in some areas which can be corrected by the proper handling and adequate treatment of all municipal and industrial wastes.

Public Health

Only one city has a system of refuse disposal which fully meets the Health Department requirements. Ten others have modified sanitary landfills that partly meet Health Department standards. These 11 facilities served a population of 97,000 people in 1960. An estimated 39

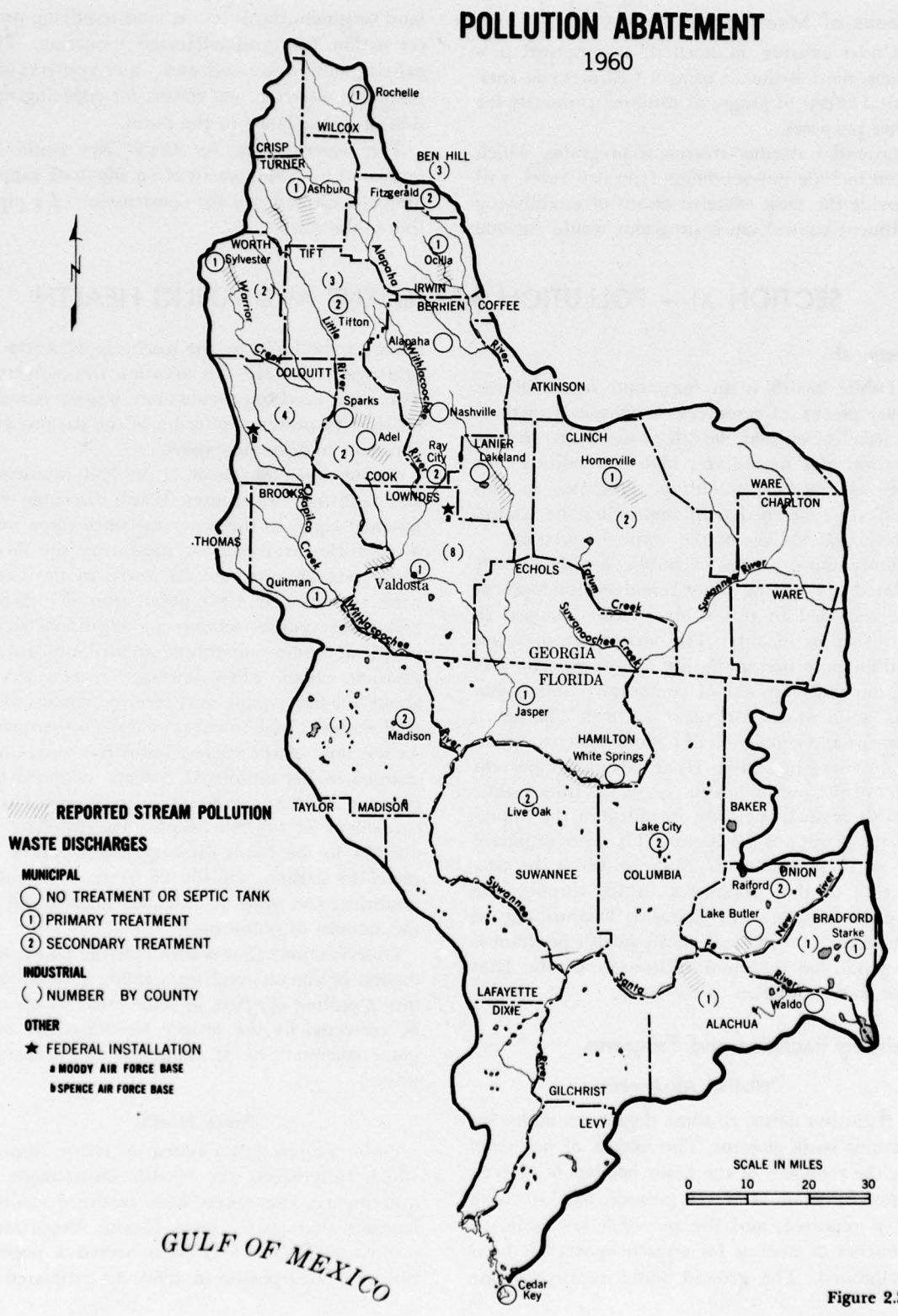

POLLUTION ABATEMENT
1960
N
REPORTED STREAM POLLUTION
WASTE DISCHARGES
MUNICIPAL
NO TREATMENT OR SEPTIC TANK
1 PRIMARY TREATMENT
2 SECONDARY TREATMENT
INDUSTRIAL
( ) NUMBER BY COUNTY
OTHER
FEDERAL INSTALLATION
a MOODY AIR FORCE BASE
b SPENCE AIR FORCE BASE
Rochelle
WILCOX
CRISP
TURNER
BEN HILL
Ashburn
Fitzgerald
WORTH
Sylvester
TIFT
Ocilla
IRWIN
BERRIEN
COFFEE
Tifton
Alapaha
ATKINSON
COLQUITT
Sparks
Nashville
Adel
Ray City
LANIER
Lakeland
CLINCH
Homerville
WARE
CHARLTON
COOK
LOWNDES
BROOKS
THOMAS
Quitman
Valdosta
ECHOLS
GEORGIA
FLORIDA
Jasper
Madison
HAMILTON
White Springs
TAYLOR
MADISON
Live Oak
Lake City
BAKER
SUWANNEE
COLUMBIA
UNION
Raiford
Lake Butler
BRADFORD
Starke
LAFAYETTE
DIXIE
ALACHUA
Waldo
GILCHRIST
LEVY
Cedar Key
SCALE IN MILES
0 10 20 30
GULF OF MEXICO

Figure 2.34

WASTE LOADING 1960
BASED ON 1960 POPULATION

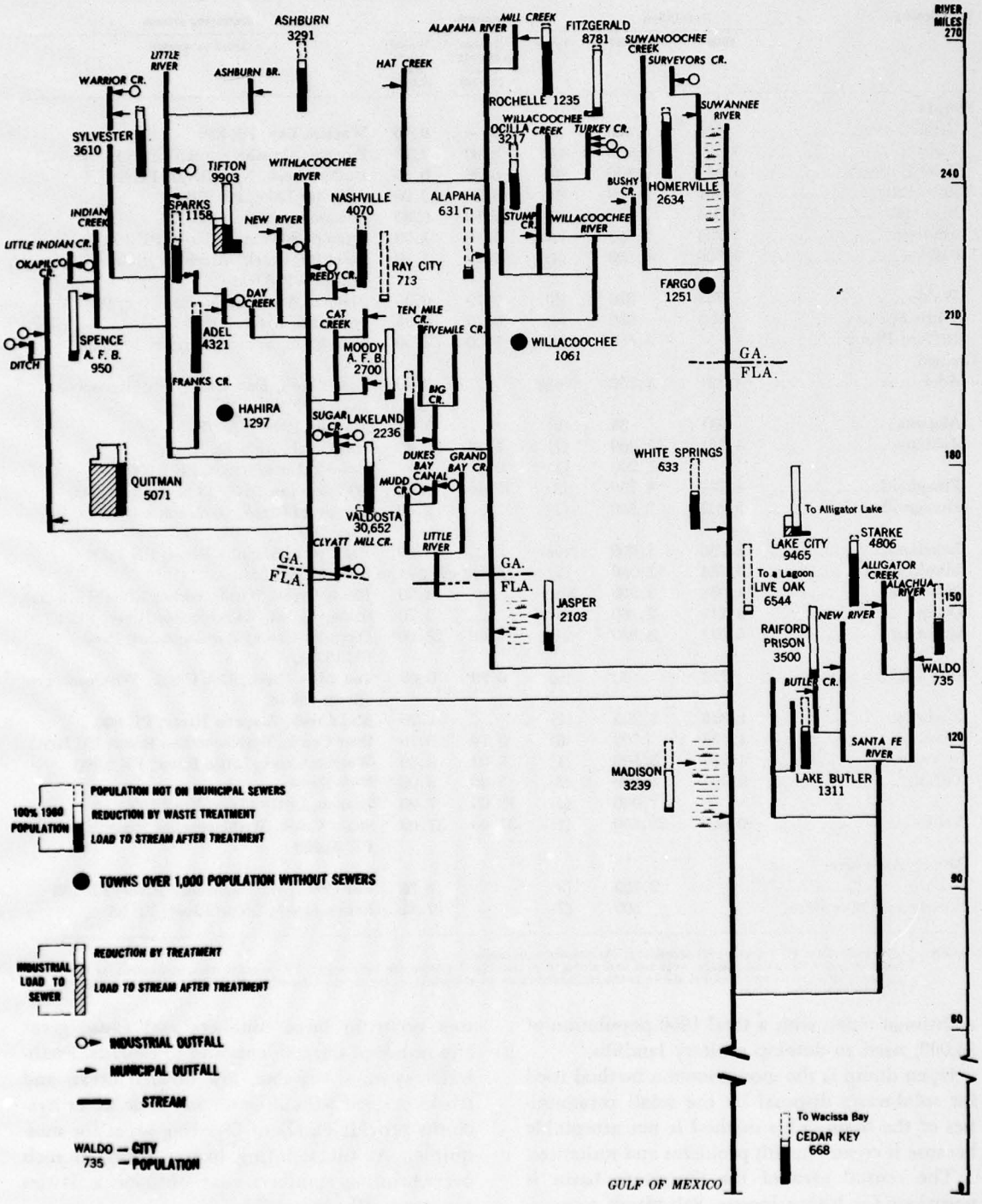


Figure 2.35

TABLE 2.14

Sources of Municipal Pollution

Municipality	Population		Treatment			Receiving stream
	1960	Served	Type[1]	Design capacity PE (1,000)	Waste load PE[2] (1,000)	Load to stream
Florida						
Cedar Key	668	400	(0)	0.50	0.40	Wacissa Bay; PE 350
Jasper	2,103	2,150	(1)	3.00	2.15	Swamp, Alapaha River; PE 430
Lake Butler	1,311	850	(0)	0.56	0.85	Butler Creek, New River; PE 680
Lake City	9,465	9,760	(2)	15.00	12.00	Alligator Lake; PE 976
Live Oak	6,544	850	(2)	7.50	0.85	Lagoon, no outlet; PE 126
Madison	3,239	1,900	(2)	3.50	1.90	Swamp, Suwannee River; PE 190
Starke	4,806	4,500	(1)	4.40	4.50	Alligator Creek, Alachua River, Santa Fe River; PE 3,600
Waldo	735	350	(0)	0.79	0.35	Alachua River, Santa Fe River; PE 320
White Springs	633	350	(0)	0.70	0.35	Suwannee River; PE 315
Raiford Prison		3,500	(2)	5.00	3.50	New River, Santa Fe River; PE 320
Georgia						
Adel	4,321	3,250	None	--	3.20	Bear Creek, Day Creek, Withlacoochee River; PE 3,200
Alapaha	631	85	(0)	--	0.09	Alapaha River; PE 75
Ashburn	3,291	1,200	(1)	1.40	2.40	Hat Creek, Alapaha River,
		1,200	(1)	0.42		Branch, Little River; PE 2,000
Fitzgerald	8,781	8,750	(3)	10.40	9.00	Willacoochee River (3 plants); PE 900
Homerville	2,634	2,500	(1)	--	2.50	Surveyors Creek, Okefenokee Swamp; PE 2,100
Lakeland	2,236	1,000	None	--	1.00	Big Creek, Alapaha River; PE 1,000
Moultrie	15,764	11,000	(2)	Plant effluent to Ochlockonee basin		
Nashville	4,070	3,200	None	--	3.20	Reedy Creek, Withlacoochee River; PE 3,200
Ocilla	3,217	2,700	(1)	--	2.70	Stump Creek, Willacoochee River; PE 1,750
Quitman	5,071	3,850	(1)	8.00	23.00[3]	Okapilco Creek, Withlacoochee River; PE 19,000
Ray City	713	50	(3)	0.20	0.05	Ten Mile Creek, Cat Creek, Withlacoochee River; PE 10
Rochelle	1,235	1,200	(1)	--	1.20	Mill Creek, Alapaha River; PE 800
Sparks	1,158	700	(0)	0.70	0.70	Bear Creek, Withlacoochee River; PE 600
Sylvester	3,610	3,500	(1)	5.00	3.50	Warrior Creek, Little River; PE 2,300
Tifton	9,903	5,000	(2)	7.50	5.00	New River
		7,000	(2)	10.00	7.00	Branch, Little River; PE 2,100
Valdosta	30,652	29,650	(1)	37.00	37.00	Sugar Creek, Withlacoochee River; PE 25,000
Moody Air Force Base		2,300	(2)		2.70	Cat Creek, Withlacoochee River; PE 150
Spence Air Force Base		500	(2)		0.95	Indian Creek, Little River; PE 95

NOTES: [1] (0) Septic tank; (1) primary; (2) secondary; (3) stabilization ponds.
[2] Includes some industrial wastes; volumes and strength of combined wastes are estimated: PE = population equivalent, is based on pollution effect of waste. The PE shown is the estimated theoretical loading on the streams, based on the degree of treatment.
[3] Includes industrial wastes.

additional cities, with a total 1960 population of 55,000, need to develop sanitary landfills.

Open dump is the most common method used for solid-waste disposal by the small communities of the basin. This method is not acceptable because it creates health problems and nuisances.

The coastal area of the Suwannee basin is notorious for biting insects. Salt-marsh mosquitoes occur in large numbers and cause great annoyance to the residents and to tourists. Freshwater swamps, marshes, low flooded areas, and creeks clogged with alligator weeds or water hyacinths provide excellent breeding areas for mosquitoes. At times, biting insects occur in such overwhelming numbers that outdoor activities are practically impossible.

TABLE 2.15

Industrial Pollution Discharged to Streams [1]

Industry Type, number, and employees	Volume of waste (m.d.g.)[2]	PE or type of waste[2]	Type of treatment[2]	Waste to stream PE[2]	Receiving stream
Chemical	0.288	(NS)	None		
12	0.240	(NS)	None		
619	0.010	(NS)	None		Turkey Branch
	0.020	(NS)	None		Suwanoochee River
	0.350	(Acid)	None		Okapilco Creek
	0.001	(Creosote)	None		Swamp, Little River
	0.020	(NS)	None		Little River
	0.022	(Acid)	None		Little River
	0.135	(NS)	None		Dukes Bay Canal, Mud Creek
	0.010	(NS)	(3)		No outlet
	0.009	(NS)	--		
	0.013	(Acid)	None		Ditch, Withlacoochee River
Food	0.200	20,000	None	20,000	Ditch
6	0.040	2,000	(0)	1,800	Branch, Withlacoochee River
830	0.700	31,400	(3)	1,540	Okapilco Creek
	0.008	1,500	None	1,500	Warrior Creek
	0.038	1,800	(0)	1,700	Dukes Bay Canal, Mud Creek
	0.006	1,080	(0)	1,000	Dukes Bay Canal, Mud Creek, Alapaha River
Metal	0.001	(Plating)	None	--	Pond
5	0.100	(Plating)	None	--	Bear Creek, Withlacoochee River
820	0.020	--	None	--	Bear Creek, Withlacoochee River
	0.002	(Cooling)	None	--	Suwanoochee River
	0.350	(Plating)	(K)	--	Indian Creek, Little River
Mining	4.320	(Turbid)	(K)	(U)	Boggy Branch, Black Creek
2	5.760	(Turbid)	(K)	(U)	Alligator Creek, Roswell Lake
340					
Paper	8.000	169,600	(3)	5,600	Withlacoochee River
1					
460					
Textile	0.001	(D)	None	(U)	Warrior Creek
2	0.046	(Wash)	None	(U)	Branch, Withlacoochee River
630					

NOTES: [1] Industries discharging to land surface or water course.
[2] m.g.d. = million gallons per day; PE = population equivalent; (0) grease and solids removal; (3) stabilization ponds; (K) chemical treatment; (D) domestic; (U) undetermined; (NS) naval stores.

In urban areas, the insect problems are frequently associated with improper disposal of sewage. In 1960, about 35 percent of the towns studied contained overflowing septic tanks which provided ideal places for the breeding of mosquitoes. Stabilization ponds, which are being constructed in south Georgia to handle municipal wastes, and farm ponds will not create a mosquito problem if properly constructed, maintained, and operated.

In rural areas, inadequate drainage and the lack of maintenance of drainage systems is responsible for mosquito breeding. Abandoned, uncapped artesian wells originating in limestone produce an alkaline water very favorable for the production of malarial mosquitoes. A few such wells exist in the Georgia portion of the basin. Also, the general lack of sanitation around farms can result in serious fly, mosquito, and rat problems.

The 1960 vector-control program included four countywide mosquito-control programs, two countywide rodent-control programs, and several municipal mosquito-control programs. Most of the mosquito-control activities were limited to killing adult mosquitoes. There is a need for more extensive elimination of the mosquito larvae. About $100,000 was spent on mosquito- and rodent-control programs in the basin in 1960.

In 1960, smoke, dust, and odors from 11 indus-

trial sources were reported as localized air-pollution problems. One large industry located near the center of the basin produces air contaminants which are carried great distances. There are many industries scattered throughout the basin which produce limited amounts of air pollution, but no complaints have been received regarding most of these sources.

There are no nuclear reactors and no licensed radioactive isotope users in the Suwannee basin. The Florida State Department of Health, in cooperation with various universities, has maintained a water-monitoring program for several years. Data published in a progress report of the State Board of Health for calendar year 1959 showed activities well below the maximum permissible level for surface and underground waters of the area. Concentrations in many samples were barely measurable.

Needs and Opportunities

Pollution Abatement

A strict policy of pollution prevention as well as abatement should be provided for all industrial and municipal wastes prior to their discharge to the waters of the basin. The degree and type of treatment required should be established based on the assimilating capacities of the receiving streams. Where critical streamflows are not adequate to provide proper assimilation of secondary treatment plant effluents, augmentation of low flows will be required. In some instances, however, it may be more economical to provide a higher degree of treatment and adjust the waste load to the available minimum streamflows.

The minimum 7-day consecutive low flow expected once every 10 years has been used in estimating the degree of treatment required to prevent an overloading of the streams capacity to assimilate wastes. Inorganic wastes which will have an adverse effect on the water qualities should not be discharged into streams.

In estimating the needs for municipal sewerage systems, all towns of 800 population have been included. Also included are smaller towns which had an existing 1960 sewerage system. A minimum of primary treatment has been considered necessary for the proper handling of all wastes, and secondary treatment with chlorination has been added wherever the assimilating capacity of the stream is inadequate to handle the primary treatment plant effluent. Dilution flows should not be provided as a substitute for primary or secondary treatment.

Estimated municipal and industrial waste-treatment facility needs are based upon the expected development of the area. Detailed studies should be made of the gas and liquid wastes to determine the degree of treatment required to prevent any further water or air pollution.

Public Health

The sanitary landfill method of solid-waste disposal appears to be the most desirable method of disposal for the communities of the Suwannee basin. The amount of solid waste produced na-

TABLE 2.16

Municipal Sewerage Facility Needs[1]

Period	State	Number of places[2]	Population served[2]	Number of places requiring new or enlarged		
				Primary treatment	Secondary treatment	Collection systems
1960-1975	Florida	23	58,600	2	20	22
	Georgia	28	144,400	---	26	26
Total		51	203,000	2	46	48
1975-2000	Georgia	29	89,000	---	9	27
	Florida	41	261,000	---	15	39
Total		70	350,000	---	24	66

NOTES: [1] All values are terminal for the period indicated.
[2] Includes Federal and State installation and the people served.

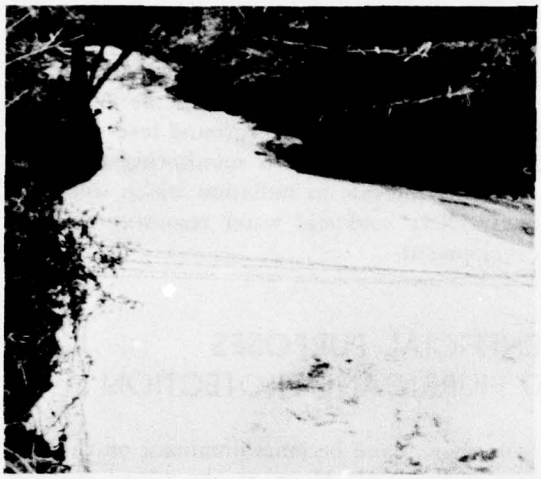


Figure 2.36 *Foamy Waste Released to Streams Creates Nuisances.*

tionally averages about 1 cubic yard or 650 pounds per person per year. To dispose of waste by sanitary landfill required 1 acre per 10,000 persons per year. The average cost of collecting solid waste, the land, and the operation of a sanitary landfill varies inversely with the size of the community and ranges from $4.50 to $1.50 per capita per year. Low, marshy areas can be utilized for the landfill operation and can be controlled to prevent fires and the breeding of mosquitoes, flies, rodents, and roaches. The filled land can then be put to higher use.

There is a need for the establishment of new municipal and county vector-control programs and expansion of all existing programs. The rodent-control programs in two counties need to be continued.

Means of Meeting the Needs

Pollution Abatement

It is estimated that an additional 90,000 people will be served by municipal sewerage systems by the year 1975. The population to be served by the municipal sewers by the year 2000 is expected to reach 350,000 people. In order to provide facilities to handle these wastes, 23 new sewerage systems having waste treatment would be needed prior to 1975. Also required are extensions to all existing systems and 48 new or enlarged treatment plants to handle the additional loading or increase the degree of treatment. Prior to year 2000, the number of sewerage systems will increase to about 70, existing systems will need extensions and enlargements, and some of the older sewage treatment plants will need complete rehabilitation or replacement.

With the expected industrial development of the area, it is anticipated that, by 1975, 32 industrial plants will need waste-treatment facilities. Their wastes can be satisfactorily handled by the installation of 10 stabilization ponds, 14 chemical precipitation plants, 2 ion exchange facilities, and 6 conventional primary treatment plants. Prior to the year 2000, 27 industrial plants will need to enlarge their waste-treatment facilities.

The estimates of municipal and industrial waste-treatment facility needs are based upon the expected development of the area. Detailed studies should be made of the wastes, their points of discharge, and the downstream water uses to definitely determine the degree of treatment required to prevent pollution of the stream.

Public Health

Revision of sanitary regulations or adoption of new ones will enable all communities to participate in an effective sanitary landfill program. This method effectively reduces the breeding of flies and rodents. The efficient collection and proper disposal of garbage and trash will improve municipal appearance and citizen morale.

Sanitary landfill methods should be adopted throughout the area for solid-waste disposal. The existing landfills should be improved and enlarged. Prior to 1975, 65 additional cities will probably need to start sanitary landfills to handle solid wastes from approximately 210,000 people; by the year 2000, it is expected that 310,000 people would be served by landfills.

There is no statewide legislation for the establishment of mosquito- or other vector-control districts in Georgia. Adequate legislation of this nature does exist in Florida. Both Georgia and Florida have specific health regulations pertaining to the impounding of water in ponds as they may affect mosquito breeding.

There is a need for the establishment of 10 municipal vector-control programs, the expansion of all existing programs, and the establishment of one new county vector-control program.

The rodent-control programs should be continued in two counties and expanded throughout the entire area, under the control of local health departments.

The States of Georgia and Florida are obtaining factual data needed to establish statewide air pollution monitoring programs. An effective program will require full industrial cooperation. The responsible State agency working cooperatively with industry can develop effective control programs.

Radiological health surveillance as a part of the expanded health program in the Suwannee basin should establish background levels of radiation and do continuous monitoring to determine any increase in radiation which could directly affect land and water resources use and development.

SECTION XII – OTHER BENEFICIAL PURPOSES BEACH EROSION CONTROL AND HURRICANE PROTECTION

General

The 29-mile shoreline of the Suwannee basin is a part of the open coast which extends from Cedar Key about 115 miles northwest to Ochlockonee Point and is characterized by features that are unique in the United States. The coast is a tidal marsh and the shoreline is, for the most part, the muddy growing edge of the marsh. The marsh represents the slow accumulation of clay, silt, and fine sand from the several rivers that cross it. An absence of waves at the shore is due to a broad offshore bank where resistant underlying limestone is very near the water surface.

Fringing the coast is a 1- to 2-mile wide belt of tidal marsh. Inshore from the marsh is a low-lying belt of intermittent cypress swamp, 5 to 10 miles wide.

At the seaward edge, the level of the marsh is about at the high point of the 2.4-foot tide; its level is slightly higher at the inner edge. The outer, or lower, zone of the marsh is about a mile wide and has lush tidal-marsh grasses, broken by meandering streams. At a few places small sandy tree-covered mounds, sinuously shaped, rise 10 to 15 feet above the marsh.

The marsh shoreline is very irregular. The beach is exposed at low tide and is generally barren mud. On some scattered stretches of this coast a thin deposit of fine white sand overlies the mud along the shore from about mean to high tide level.

Offshore the bottom is shoal; the 2-fathom contour is generally 5 miles or more from shore. Along most of the coast, the bottom is only 2 to 3 feet below mean low tide as far as 2 miles from shore. Sand becomes dominant on the bottom farther out. Many of the island surfaces exposed at low tide are a mixture of fine sand, silt, and clay.

Numerous bars and reefs occur within a mile or two of shore, particularly along the southern part of this coast. Many of the reefs are narrow, linear, or sinuous to crescent shaped. In places, particularly in the vicinity of Cedar Key, they interconnect into a curious network and rise to levels as high as mean tide. These may be oyster-reef formations.

Because storm-wave energies are dissipated against the resistant rock platform well offshore, this reach of shore is essentially one of low energy. Changes which have occurred to the mean high water shoreline have been relatively minor and usually less than 100 feet laterally. In the few areas where the shoreline movement has been as much as 500 to 700 feet, the length of the reach ranges from 1,000 feet to 1.5 miles. Perhaps the two most important features of this entire reach of shoreline are (1) that there has been a gradual retreat of the shoreline from the earliest to the latest surveys and (2) the relative positions of the shoreline have changed rapidly in limited distances alongshore. In relatively short distances of about 1,000 feet, a comparison of the shorelines may show an eroding condition and landward migration of the mean high water shoreline. Adjacent to this, the reverse or gulfward migration of the shoreline may be evident.

On the west coast of Florida from Cape Romano, far south of the Suwannee River, to the Aucilla River, 100 miles to the north, fragmentary records list 14 known hurricanes from

1830 to 1900. From 1900 to 1958 there were 22 major hurricanes and 33 tropical storms which crossed or passed within 50 miles of this reach of shore. In the region from Cedar Key northwest to the Aucilla River, the frequency of hurricanes has been less than that farther south. The season at which the most severe hurricanes occurred, for the period from 1900 to 1955, was between July and October. The greatest number occurred in September. The hurricanes of August 10 and 15, 1928, contributed to the second highest river flood of record in the basin. Hurricanes in 1894 and 1896 took many lives and caused heavy losses to property and boats at Cedar Key.

Existing Facilities and Programs

There are no beach erosion control facilities of significance in the Suwannee basin. The character of the Suwannee shoreline is such that no major ocean-front developments are anticipated other than for recreational development of Hog Island as described in Part Four. Private developments would create new problems only if they were more extensive than now anticipated.

The Weather Bureau prepares and issues warnings of hurricanes, and as hurricanes approach coastal areas, the warnings include information on expected winds, rainfall, and flooding from high tides and storm runoff.

Needs and Opportunities

The largest coastal community in the Suwannee basin is Cedar Key which is situated on two offshore islands a few miles southeast from the mouth of the Suwannee River. Elevations range up to 15 feet on the islands. About 40 percent of the urban areas is subject to tidal floodings. Other areas along the shoreline could be inundated during passage of a major hurricane by as much as 5 to 10 feet of hurricane tide and wave action.

Early evacuation of low areas is imperative since many of the evacuation routes are subject to early inundation as tides rise along the coast prior to the storm landfall.

Means of Meeting the Needs

In recent years the hurricane warning service has improved largely because of radar and aerial surveillance. Additional improvement is necessary to the optimum development of coastal regions.

This additional improvement could come from providing resources for improved forecasts of hurricane tracks, quantitative forecasts of hurricane rainfall, and machine methods for forecasting floods.

Dissemination of forecasts and plans for necessary evacuation and other protection are most effective in areas where local organizations have been formed for disaster preparedness.

Other Purposes

No other purposes have been studied in detail.

PART THREE – COMPREHENSIVE PLANNING

The procedures used in developing the comprehensive and coordinated plan are briefly summarized in the following four steps: (1) An inventory was made of basic resources and related developments within the basin; (2) needs for goods and services were projected to the year 2000 for the Suwannee basin; (3) alternative ways to meet needs for each purpose were studied; and (4) projects and programs that would best serve all purposes and meet requirements for resource conservation, utilization, and development were selected.

The character and effect of plans in other basins were considered in connection with the formulation of the Suwannee basin plan, and adjustments were made to permit optimum interbasin resource uses.

Throughout the planning process, many factors such as those associated with geology, hydrology, engineering practices, and social characteristics were expressed in economic terms for convenience in making comparisons. Additional information on planning and plan formulation is provided in the Planning, Economics, Hydrology, and Engineering and Cost Appendixes.

SECTION I – OBJECTIVES AND GUIDELINES

Objectives and specific planning guidelines adopted to govern the study and report are as follows:

(1) A *coordinated comprehensive* plan for the development of the land and water resources of the Southeast River Basins through the year 2000 will be presented in the Report.

(2) The comprehensive plan will be recommended to the Governors and legislatures of the States of the study area and to the President and the Congress for use as a guide for land and water resources development in the Southeast River Basins area.

(3) The plan will set forth an early action phase which will include projects and programs found to be needed, feasible, and desirable for accomplishment by 1975.

(4) It will be recognized that additional studies of recommended projects and programs may be required to support specific requests for State and Federal support and for development by private agencies.

(5) All of the purposes enumerated in the Act will be given equal attention. In the completed plan, each purpose will be developed to that level consistent with the needs and economic capacity of the individual basin. Treatment of industrial development will be limited generally to indications of the effects of the plan on rates of development and to development implied in the projections of manufacturing employment. Recreation studies will be limited to public outdoor recreation related to land and water resources and to types beyond those normally provided by individuals and municipalities. Public health studies will be oriented toward determining the effects upon public health associated with the development of land and water resources.

(6) In determining the composition of the comprehensive plan, each separable component will be considered on the basis of the contribution that it makes in net benefits to the Suwannee basin, the Southeast River Basins, and the Nation. When intangible considerations play a major part in the decisions affecting an element of the program, they will be explained as fully as possible in narrative form.

(7) The comprehensive plan will: Provide information on benefits and costs, including monetary and nonmonetary values; contain information on the expected economic impacts created by the recommended elements of the plan; include general recommendations on cost sharing, reimbursement, and project payout; designate whether recommended developments should be implemented primarily by non-Federal or Federal entities; and designate which of the Federal agencies has the major responsibility for the Federal aspects of a project or program.

(8) The comprehensive plan will recognize and protect the rights and interests of individuals and of the States in determining the development of land and water resources and the preservation and protection of established uses.

(9) The comprehensive plan will include the existing, authorized, and formally proposed works and programs of the Federal and non-Federal agencies with proposed modifications limited to those found desirable, feasible, and consistent with the study objectives.

(10) Recommendations will be made for periodic review of the comprehensive plan. This review will serve as a basis for keeping the plan current and for subsequent action.

SECTION II – PLANNING ASSUMPTIONS AND CRITERIA

Assumptions

The comprehensive plan is based upon a series of assumptions. The broadest of these are: (1) That the Nation is entering a period of relative stability in international relations with no worsening of the cold war and no widespread outbreak of hostilities; and (2) that throughout the period covered by the plan, to the year 2000, the Federal Government and non-Federal interests will cooperate in encouraging and implementing economic growth and development throughout all segments of society and all areas of the Nation.

Population Growth

Three principal assumptions concerning the rate of national population growth were adopted: (1) The present fertility level, 1955-57 average, will remain constant to sometime between 1975 and 1980, then decline to the 1949-51 level by 2005-2010; (2) there will be moderate declines in mortality rates to the end of this century; and (3) net migration from abroad will be constant at about 300,000 per year. State and area population estimates were made in conformance with the general assumptions, but special attention was given to conditions reflected by study and analysis of individual areas.

Economic Growth and Development

The assumptions concerning trends toward world peace and United States and regional population growths are paralleled by assumptions of upward trends in employment, production, consumption, and foreign trade. For planning purposes, the gross national product was projected to increase from about $500 billion in 1960, to $888 billion by 1975, and to $2,300 billion by the year 2000.

A continuation of the trend in the human diet toward more red meats and more of some fruits and vegetables is reflected in the projections and plans for food production and land use. It was assumed that per capita consumption of food will increase until about 1975 and then remain about constant.

In line with the general expansion of the national and regional economy, it was assumed that investment capital required to attain projected industrial growth and resource development will be available and that the education and technical skills necessary for an expanding industrial economy also will be available. It was further assumed, as a working procedure for preliminary studies, that land and water resources and electric power supply would not be limiting factors in attaining the projected economy of the Suwannee basin. It was recognized in the study that the economy of the Suwannee basin is an integral part of the regional and national economies.

National and Regional Viewpoints

Because of the widespread effects of land and water resource development, a responsibility falls on all levels of government and on the private economy to participate in resource planning and in the execution of resource programs.

In developing the Southeast River Basins plan, national needs for food and fiber and for services are included at those levels warranted by the comparative advantage and existing economic potential of the Southeast River Basins area in relation to national resources and needs. Thus, the primary benefits shown for projects and programs provide a reliable index of project efficiency from the national point of view as well

as the principal measure of regional and local benefits. Secondary benefits and impact studies provide additional evidence of the regional and local effects of resource development.

In developing projects and programs in the Suwannee basin plan, consideration was given to national policy guides pertaining to land and water resources development that have resulted from legislation and to administrative policies or decisions that have prevailed. Policy guides and statements of national objectives used in the planning processes are discussed in the technical appendixes.

Criteria

Price Levels

Price levels prevailing on or about January 1960 were used for evaluating all present and future benefits and costs, except that an adjustment was made in agricultural prices based upon an assumption of a long-range parity ratio of 89 between prices paid and prices received by farmers.

Interest Rates

An interest rate of 2⅝ percent was used as far as practicable in analyzing costs and benefits in project formulation. In certain instances, benefits and costs were extracted from available data, and it was impractical to adjust this interest rate when the interest rate mix of the data was uncertain. The 2⅝ percent interest rate meets the need for a relatively risk-free and inflation-deflation-free rate for use in evaluation of the economic effects of Federal resource projects and programs. For converting certain non-Federal costs and benefits to an annual equivalent basis, a 4¼ percent interest rate was used.

Life of Projects and Period Covered by Analysis

The period of analysis used in the studies for this Report was the economic life of each project or 50 years, whichever was the lesser. The possibility of a longer maximum period, up to 100 years was considered in recognizing certain long-range effects of intangibles and other impacts, but effects beyond 50 years were not evaluated in monetary terms.

The plan was formulated to meet only those needs expected to develop to the year 2000, and the evaluations generally reflect no increase in use of facilities after the year 2000. Needs will naturally continue to grow after the year 2000, and many of the proposed projects and programs, by adding facilities, will have the capacity to absorb some of the growth. The potential of the plan to meet needs that develop after the year 2000 has not been evaluated.

The assumptions and criteria used are considered conservatively low. If more liberal criteria had been used, such as a period of analysis of 100 years and an increasing need after the year 2000, the projects and programs included in the plan would appear even more favorable.

Basis for Comparison of Projects Effects

Comparison and evaluation of the proposed projects and programs in the plan were made to determine the most effective use of economic resources, such as land, water, labor, and materials. In this way, actions and opportunities throughout the economy form a check on what is economically justified in the way of new plans and efforts.

The value of the projects or programs included in the plan are computed on the basis of future conditions "with" the projects or programs included in the plan as compared to future conditions "without" the projects or programs included in the plan.

The future "with" conditions for individual project or program analysis include all development which would be expected to occur during the period of analysis with the project or program in existence.

The future "without" conditions include all developments that are existing or under construction as of January 1960, assuming adequate operation and maintenance of those developments. Technological gains not directly associated with the projects and programs in the basin plan were recognized as part of the "without" condition. It was assumed that no part of the projects or programs would develop in the absence of the project or program. This is not to deny that, in the absence of the comprehensive plan, other plans would develop which might include many features similar to those in the recommended plan.

Timing of Development

Plans covering long periods into the future provide for needs which have not yet developed. Not all developments are needed at once or at the same time. Plan implementation should, therefore, be scheduled to meet the needs as they occur. A precise schedule of year-to-year development was not considered necessary, but a general order of priority was established. Those developments needed first are included in an early action phase and are generally based on filling the needs to the year 1975. If need arises, however, projects scheduled in the 1975-2000 period may and should be initiated earlier. Likewise, the rate of project initiation may be slowed down if conditions warrant slower action.

Discount Principles

Program or project benefits and costs, which are estimated to accrue at different times and over varying periods of time, were converted to annual equivalent values by use of compound interest or discount rates. The resulting values reflect the present worth at the inception of each program or project and provide a common basis of measurement.

Benefits

The ultimate aim of resource projects and programs, in common with all other productive activity, is to satisfy human needs and desires. Goods and services are produced to achieve this end. These goods and services have value in accordance with the demand for them and their availability. Benefits are of two general kinds, primary and secondary. Primary benefits are the increase in the value of goods or services directly resulting from a project, less all associated nonproject costs incurred in their realization. Primary benefits are usually evaluated at the first point in the chain of effects of a project where the goods or services produced have an actual or estimated market value. Secondary benefits are the value of goods and services created in secondary activities affected by the project, less all associated costs incurred in their realization. The major part of the value of these goods and services is not measured from the national public point of view because it is assumed that an investment similar to that made in the project would create a similar effect in secondary activities if invested in other projects or other areas. However, overall secondary benefits are considered appropriate in illustrating the significance of projects from a regional point of view.

Primary Benefits

Primary tangible benefits, which in this Section are referred to as primary benefits, represent the estimated increase in the value of the actual goods, services, and satisfactions of a project or program expected for the period under study and from which any induced losses to other projects or programs have been deducted.

The primary benefits from drainage and flood-loss prevention, resulting from the upstream watershed projects, are derived from net values for expected changes in land use, the increased productivity of land, the reduction of direct damage to agricultural crops and fixed improvements, and reduction of management costs.

Justification of the facilities included in the plan for drainage, irrigation, and soil conservation are based on the increased net return to the farmer from the estimated production response.

Primary benefits from the forestry program are estimated as the net stumpage value of increased production and the net leasing values received from the increased number of faces expected to be worked for production of gum-naval stores.

The primary benefits from the commercial fishery program are the estimated value of increased landings of commercial fish.

Primary benefits from the sport fisheries and wildlife program are the estimated value of projected increases in user-days of hunting and fishing.

Benefits used in the monetary evaluation of the recreation program consist of the estimated value of increased user-days of recreational activity.

The benefits from domestic, municipal, and industrial water supplies are assumed to be at least equal to the cost of obtaining water of similar quality and quantity from the cheapest alternative source, and are evaluated in monetary terms only for water supply storage in multiple-purpose reservoirs.

Primary benefits from flood control are derived from the difference in flood losses "with" and "without" protection. For upstream water-

shed and local protection projects, enhancement and restoration benefits are also included where applicable.

Justification of programs for vector control, solid-waste collection and disposal, air pollution and radiation monitoring, and sewage treatment is found in intangibles. In multiple-purpose projects, including storage to provide dilution water for specific localities, the pollution abatement benefits were taken as equal to the average cost of tertiary treatment to provide the same water quality. Where low-flow augmentation was provided for general purposes such as fish and wildlife, recreation, and maintaining an industrial development potential, a portion of the benefits from such other uses was transferred to, and analyzed as a part of, the pollution abatement purpose. The maximum allocation to low-flow augmentation for general uses was arbitrarily limited to 15 percent of the reservoir project cost.

Secondary Benefits and Impacts

Although for purposes of this study a monetary evaluation of secondary economic effects of various resource projects and programs was not made, the importance of these secondary effects of resource development was recognized.

The projects and programs involving increased production of commodities would require additional raw materials, processing equipment, and services to sustain the processing operation. These increased activities would extend throughout the basin. Trades and services especially would be stimulated by recreation, sport fishing, and wildlife developments. These impacts would particularly affect fishing camps, marinas, commercial boat docks, motels, sporting goods stores, service stations, boat dealers, restaurants, and many related new businesses.

Construction projects create a temporary influx of workers who spend money in local areas, but at the same time, such projects will create problems of housing, schooling, transportation, and other community services. The solution of these short-term problems should result in long-range gains with construction of facilities that would be needed to meet future expansion.

There are areas in the Suwannee basin which have been designated redevelopment areas by the Area Redevelopment Administration of the U. S. Department of Commerce. These areas were so designated because of varying reasons such as low median family income and persistent and substantial unemployment or underemployment. Execution of the plan for the Suwannee basin would assist in the relief of these conditions and aid in raising the economic level of the people. Substantial net secondary benefits are most frequently realized in areas where resource development projects make it possible to utilize unemployed and underemployed labor and unused facilities and resources.

Intangible Benefits

Intangible benefits are those which are not evaluated in monetary terms. Like tangible benefits, these may be primary or secondary in character. Many programs and projects make substantial contributions to public security, to private and public health, and to public safety and tranquility, all of which include large elements of intangible value. Intangible benefits and costs are recognized in programs and projects analyses.

Costs

Costs are the value of labor, goods, and services exchanged to gain goods and services valued more highly. Where the costs are tangible values, the assumption is made that the needs of the project are taken from present uses at marginal unit prices and, therefore, the values foregone represent the least important uses that the market would allow. In a resource program as complex as that recommended for the Southeast River Basins, there are also many intangible costs involved.

The costs of proposed projects and programs include the initial investment which would be incurred in one or more stages of construction and the annual expenditures required for operation, maintenance, and replacements. Investment costs include the capital expenditures associated with constructing a project and carrying out a program. However, interest during construction is omitted where the period of construction was not expected to exceed 2 years. Where the period of construction was estimated to be more than 2 years, the investment included simple interest on one-half of the construction costs for the period of construction.

Capital investment and operation and maintenance costs of multiple-purpose projects were allocated to the several purposes served so as to form a basis for reimbursement and cost-sharing arrangements that may be required. The procedures used are summarized in Appendix 9, Economics.

Intangible Costs

In evaluating resource programs and projects, many important program and project effects cannot be adequately measured in monetary terms. Loss of scenic values is an example of an intangible cost frequently associated with resource development. Treatment of these intangible effects has been subjected to many of the requirements applicable to tangible effects. These include: (1) Considering effects in terms of differences "with the project" and "without the project," and (2) considering intangible costs to the same degree or extent as intangible benefits.

Cost Sharing

Cost sharing is concerned primarily with the distribution of costs among the participating interests. The division of cost is shown in two groups: Federal and non-Federal. For each specific project or program, the actual division of cost among the Federal and non-Federal interests was determined by the nature of the development and on the basis of circumstances expected to prevail during the evaluation period.

Generally, where the impacts of projects and programs are largely local, the costs are the responsibility of non-Federal interests. Projects and programs of national significance are the responsibility of the Federal Government. Between these two extremes there are a number of projects and programs where the costs are to be shared by the Federal and non-Federal groups.

In determining the degree of Federal participation in programs and projects of less than national significance, consideration was given to: (1) The need for demonstrating new approaches to resource development and use; (2) the usefulness of a local project or program in additional studies and experimentation which has more than local implications; (3) the support of projects or programs which by policy or legislation have become accepted as Federal or part Federal responsibilities, such as flood control; and (4) the possible justification for Federal participation in the cost of local works and improvements where counties, areas, or regions are designated as distressed and in need of economic assistance.

Financing

Determination of effective ways for financing land and water development is an essential part of resource planning. Financing, as used here, relates to the immediate source of funds needed for construction and management of proposed works. Financing requirements were developed only as Federal and non-Federal although in the analyses, State, county, municipal, and private financing were considered. Special groupings for purposes of financing, such as development corporations and special improvement districts, are also discussed.

The following criteria were used in determining appropriate methods for financing land and water resource developments.

(1) Developments of natural resources that do not involve national consideration will be the responsibility of private, local, and State interests.

(2) Where the costs of projects and programs are to be shared between the Federal and non-Federal interests, each will provide for the financing of its share, except as noted under item (3) following. The Federal share will be provided under such laws and regulations as are applicable at the time of financing. In addition to direct government and private appropriations for the non-Federal share, development funds, authority funds, special bond issues, and revenue bonds are available for financing.

(3) For projects such as hydroelectric power and water supply, Federal financing may be needed, with provision for reimbursement from non-Federal beneficiaries, as is now practiced. Federal financing may also be required for projects of the types not adequately covered by traditional approaches. This includes large-scale recreation projects and some types of fish and wildlife work.

(4) When the Federal Government assumes the full cost of a project or program, the Federal Government will be responsible for full financing of the work.

SECTION III – PLAN FORMULATION

Selecting and fitting planning segments together and considering alternatives in the search for the proper programs, the proper number of projects, and the best size for each element of the overall plan required extensive analysis. By a series of approximations using the incremental approach and limited by consideration of alternatives and judgment, a plan was formulated containing those programs and projects that will usually result in maximum benefits above costs in meeting needs to the year 2000.

General Character of Resource Planning

Generally, resource planning recognizes the consequences of land and water resource development and the need to anticipate the future requirements for land and water essential to growth and welfare. The physical and economic aspects of the planning task have been emphasized, particularly as they relate to the scale, sequence, and timing of development plans. However, these considerations have been tempered by the recognition of social, legal, and political factors.

The plan has been developed on the basis that free enterprise persists in the area and the Nation with Federal and State Governments undertaking those tasks which are beyond individual or voluntary group capacity or which require such action for special physical, economic, social, or other reasons. Local and regional viewpoints were recognized in formulating the plan.

Guides for Plan Formulation

A number of general land and water resource development guides and planning aids were used in weighing and selecting those alternatives which were fitted into an effective plan. In all cases, the effective use of these guides and planning techniques required careful adherence to the assumptions and criteria outlined in Section II.

Plan Evaluation

Comparison of benefits with costs was one of the principal guides used in plan formulation. These comparisons attempted to cover all beneficial and adverse effects. While favorable primary tangible benefit-cost relations were the principal basis used in selecting programs and projects, intangible costs and benefits were also considered in making the plan. Measurements made reflected existing and probable future economic conditions, including estimates of the probable needs for the many goods and services which land and water development make possible. Benefit-cost data were applied to a range of interdependent physical and social possibilities and the resulting scale used for judging and selecting the means of development, the scope of facilities needed, and the site or area involved.

Increments and the Scale of Development

To achieve a reasonable scale of development, it was necessary in the formulation process to divide the work into manageable units. Planning units, usually called separable segments or increments, were the smallest units on which there was a practical opportunity for inclusion in or omission from the plan.

To meet the general objectives of maximizing net economic returns and satisfactions from the economic resources used in the plan, each part of the plan was formulated to include each separable segment or increment which would provide benefits at least equal to the cost of that segment or increment with full consideration of intangible values. Plan formulation was completed when analyses demonstrated that (1) there was need for the goods and services produced, (2) total benefits exceeded total costs, (3) each separable segment or purpose provided benefits at least equal to its cost, (4) the scale of development was such as to provide the maximum net benefits, and (5) there were no more economical means of accomplishing the same purposes.

The Nucleus Plan and the Multiple-Purpose Concept

A specific initial proposal generally was chosen as the nucleus around which planning proceeded. This nucleus usually represented a project or program which seemed to offer promise of meeting a major objective or objectives.

After the initial proposals of development were selected for analysis, and benefits and costs

measured, consideration was given to larger or smaller scales of development. Variations in the scope of each separable increment were made and tested and the possibility of additions or omissions examined. Early in this process, the possibility of multiple-purpose projects was considered. By the process of elimination, the most promising combination of projects and programs was identified and tested to determine where a justified nucleus had been found. The incremental analysis was continued by adding segments of size, purpose, or means, and by evaluating the resulting increments of benefits and costs. Thus, the incremental analysis was a series of comparisons of alternative plans "with" and "without" the inclusion of particular segments. Short cuts were frequent and necessary but those principles were followed. By this fitting process, modifications were made in the initial plan. This process was continued within practical limitations until the best combination was evolved to meet the established needs.

Sequence of Development

The sequence of project development is basic to maximizing overall project benefits. Project benefit and cost comparisons are misleading unless they represent the incremental benefits and costs of projects in a specified sequence of development. This problem was recognized in the studies by dividing proposed developments into those requiring early action and those which could be accomplished by later action. Further refinement in timing could lead to some changes in incremental benefits and costs.

General Information and Basic Data

Some of the general information essential to planning in the basin was available but not always in the most useful form. Much of it required reorganization prior to analysis. While little original research was undertaken, professional interpretation of data and problems was frequently sought in the planning processes. The available data on past and current programs and on resource plans underway by Federal, State, and, to some degree, private agencies became a part of the basic planning information.

A problem repeatedly encountered in the studies was the lack of basic data. Topographic maps with a contour interval of 10 feet or less are available for only a small percent of the basin. Many of the areas have maps with a contour interval of 50 feet. Hydrologic data are available, on at least a short-term basis, at main stream points only. Practically no data are available for the smaller tributaries. Ground water information is meager and little data exist regarding water quality. Geologic information, which is very important, is limited to local areas and to generalized data. Pertinent economic statistics have been less than adequate, except during the last few years. Much of the lack of data can be attributed to the fact that the basin has never approached full development of its resources. Consequently, there has been minimum effort to collect basic data. However, more competition for resource use is beginning to arise, and selection between uses will be increasingly important as the demands increase. Adequate basic data are essential to making proper selections, so steps need to be taken promptly to insure that the information will be available when it is critically needed.

Single-Purpose Planning

Single-purpose planning for each purpose was carried to the point of establishing needs and determining most likely ways of meeting the needs with the least expenditure of resources. Studies for some purposes were carried into more detail than others in examining alternative ways of meeting needs. Where it was apparent that a single-purpose plan could be used without major modification in the comprehensive plan, the single-purpose studies were carried to more detail than in those cases where the purpose would be included, with perhaps major modifications, in a multiple-purpose development.

Multiple-Purpose Planning

Information developed in single-purpose planning and the special problems of the area were the initial bases for development of a multiple-purpose plan for the Suwannee basin.

The programs and projects which served as nuclei for the initial planning were based on the character of the resources, the nature of the problems, and the nature of the land and water projects already established or planned as por-

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trayed in the single-purpose plans. Proposals considered for the inclusion in the plan came from many sources. Citizens throughout the area and local development organizations expressed interests in projects of many kinds and suggested combinations of resource use and development which they believed would meet particular needs. Federal and State agencies were also the source of much information on possible projects and project combinations.

Consideration was given to complementary land and water uses. Following the development of single-purpose ways for meeting needs, studies of compatible resource uses and areas of potential conflict in resource use were made. It was found that needs for forestry, recreation, and fish and wildlife could frequently be met by proper utilization of the same land resource. Similarly, water resource development plans could acceptably serve the purposes of flood control, water supply, fishing, and recreation, although operating adjustments had to be considered so that the most favorable multiple-purpose operating arrangements could be assured to maximize overall net benefits.

When sufficient preliminary study had been made, a series of detailed studies were undertaken to choose from among the alternatives those filling the needs most effectively. In this process, the problem of deciding among competing uses sometimes arose and there was always present the need to seek arrangements whereby the greatest play of complementary values would occur. This process involved a repetitious series of adjustments, in varying degrees of refinement, combined with progressively refined economic, hydrologic, and engineering comparison, until the best combination of proposed developments was found.

Nature and Treatment of Alternatives

In resources planning, comparison of alternatives is a vital part of the planning process. It is necessary to understand the nature of projects and programs rejected and the reasons for rejection, as well as the character of those accepted in the plan. Information on alternatives considered is summarized in Part Four. Additional detail concerning the nature of the alternatives considered and the reasons for their acceptance or rejection in the final plan are included in Appendix 12, Planning.

Competitive Uses

Many resource uses are competitive in character. The principal guidelines established and generally followed in determining the use of land and water resources are summarized as follows: (1) Resource utilization was based on and limited to the projected future needs, and (2) economic efficiency was a major governing criterion in deciding between alternative uses of a given resource, with due consideration given to social, political, and physical factors. Some of the situations requiring special attention are: (1) Existing, reserved, or special use land and water resources; (2) public health; (3) special requirements involving areas that provide a particular type of land or water use that cannot be duplicated elsewhere at a reasonable cost; and (4) those resources to which priority considerations should be given because of long established or firmly fixed development trends.

Adjustment Among Basins in Planning

Interbasin relations were recognized, to the extent practicable, when Southeast River Basins needs were developed and distributed among basins to provide planning objectives for each basin. For example, user-days of recreation demand for a given population center were distributed to all basins within reasonable travel distance from the center, rather than being allocated exclusively to the basin within which the center lies. A check was made to insure that the overall cost of meeting each need was not inflated by unreasonable disparities in unit costs. Adjustments between the Suwannee and other basins were made where reasonable alternatives were available and where overall efficiencies could be improved by the adjustments.

PART FOUR – BASIN PLAN

SECTION I – COMPREHENSIVE BASIN PLAN

The plan for the Suwannee basin includes two general types of development—continuing programs such as those for soil conservation and forestry that are carried on from year to year and individual projects which involve relatively large but short-term construction expenditures to create benefits that will accrue over a long period of years.

Although both are important, the continuing programs cover the largest part of the total development. These programs are already underway and the anticipated changes are of intensity or magnitude rather than of type of development. The projects involve complicated systems of water control and new types of facilities.

In order to meet the needs for water control,

TABLE 4.1

Comprehensive Plan for Development
(thousands of dollars)

Project or program	Purpose[1]	Benefits[2]	Costs		
		Annual equivalent	Annual equivalent		Investment
			Total	Operation, maintenance, and replacements	
Franks Creek	R, F&W	1,016	319	161	4,470
Tifton	FC, I, R, F&W, PA	424	290	125	4,570
Hixtown Marsh	I, R, F&W	68	65	18	1,270
Moultrie	FC, I, R, F&W, PA	284	154	52	2,860
Mud Swamp	F&W, R, I	40	34	14	525
Quitman	FC, I, R, F&W, PA	1,162	832	275	15,900
Nashville	FC, I, R, F&W, PA	916	287	108	4,949
Shiloh	FC, I, R, F&W, PA	2,062	922	337	16,200
Ashburn	FC, I, R, F&W, PA	145	68	29	1,090
Alapaha	FC, I, R, F&W, PA	863	536	188	9,640
Water-access areas	R, F&W	2,333	881	531	9,720
Upstream watersheds	FC, D	1,593	422	98	8,980
Water supplies	WS	[3]	1,696	1,138	22,440
Navigation	N	11	9	7	70
Irrigation[4]	I	5,011	1,649	1,375	7,560
Drainage[4]	D	855	38	18	534
Soil conservation	SC	4,860	2,686	1,894	21,920
Forest conservation	F	6,733	3,889	1,774	86,840
Fish and wildlife[4]	F&W	2,027	1,438	1,429	418
Recreation[4]	R	4,644	1,883	1,145	23,610
Pollution abatement[4]	PA	[5]	1,389	373	40,100
Public health[4]	PH	[5]	1,006	1,006	—

NOTES: [1] FC – Flood control; D – Drainage; R – Recreation; WS – Water supplies; SC – Soil conservation; PA – Pollution abatement; N – Navigation; F – Forest conservation; PH – Public health; I – Irrigation; F&W – Fish and wildlife

[2] Primary tangible only; intangible and secondary benefits and impacts considered are presented in narrative.

[3] Benefits are assumed to be at least equal to the cost of the cheapest alternative but are not assigned monetary values.

[4] Data presented are exclusive of costs and benefits associated with multiple-purpose projects.

[5] Justification is based largely on intangible benefits except for pollution abatement resulting from dilution water provided by multiple-purpose projects.

a system of 11 reservoirs is planned. Seven of the reservoirs—Shiloh, Tifton, Moultrie, Okapilco, Nashville, Ashburn, and Alapaha—are primarly storage works with one-half million acre-feet of capacity for pollution abatement including lowflow augmentation,[1] flood control, fish and wildlife, and other purposes. Two of the reservoirs—Franks Creek and Quitman—provide constant level water surfaces for recreational use. Quitman reservoir is dependent upon Okapilco reservoir storage for the water control needed to make it an attractive recreation area and the two are combined into the Quitman project for analysis purposes. Two reservoirs—Hixtown Marsh and Mud Swamp—control water levels in 12,300 acres of natural swamps for fishing, sightseeing, and waterfowl management.

The comprehensive plan for development includes existing and proposed programs to meet the needs of the basin projected to the year 2000. New projects and programs to be installed after 1960 are summarized in Tables 4.1, 4.2, and 4.3.

[1] See discussion in Appendix 9, Part Four.

SUWANNEE BASIN PLAN FEATURES

(key to numbers shown on Fig. 4.1)

1 Ashburn Reservoir
2 Crystal Lake Recreation Area
3 Jefferson Davis Memorial State Park Recreation Area
4 Alapaha Wildlife Management Area
5 Tifton Reservoir
6 Alapaha Reservoir
7 Worth Wildlife Refuge
8 Colquitt Wildlife Refuge
9 Stillbay Wildlife Management Area
10 Moultrie Reservoir
11 Cook-Colquitt Recreation Area
12 Nashville Reservoir
13 Arabia Bay Wildlife Refuge
14 Waycross State Forest Wildlife Management Area
15 Okefenokee Swamp Park Recreation Area
16 Okapilco Reservoir*
17 Quitman Reservoir*
18 Shiloh Reservoir
19 Franks Creek Reservoir
20 Moody Air Force Base Wildlife Refuge
21 Banks Lake
22 Suwanoochee Wildlife Management Area
23 Okefenokee National Wildlife Refuge
24 Stephen C. Foster State Park Recreation Area
25 Mud Swamp Reservoir
26 Withlacoochee Wildlife Management Area
27 Hixtown Marsh Reservoir
28 Suwannee River State Park Recreation Area
29 Stephen Foster Memorial
30 Osceola National Forest Recreation and Wildlife Management Areas
31 Olustee Battlefield State Memorial
32 Suwannee River Recreation Development
33 Lake Butler Wildlife Management Area
34 Ichetucknee Spring Recreation Area
35 O'Leno State Park Recreation Area
36 Camp Blanding Wildlife Management Area
37 Steinhatchee Wildlife Management Area
38 Hart Spring Park Recreation Area
39 Manatee Spring State Park Recreation Area
40 Suwannee Gulf Recreation Area
41 West Gap Channel
42 Gulf Coast Improvement Project (Project description appears in Appendix 6)
43 Cedar Keys National Wildlife Refuge

* Included in Quitman Project.

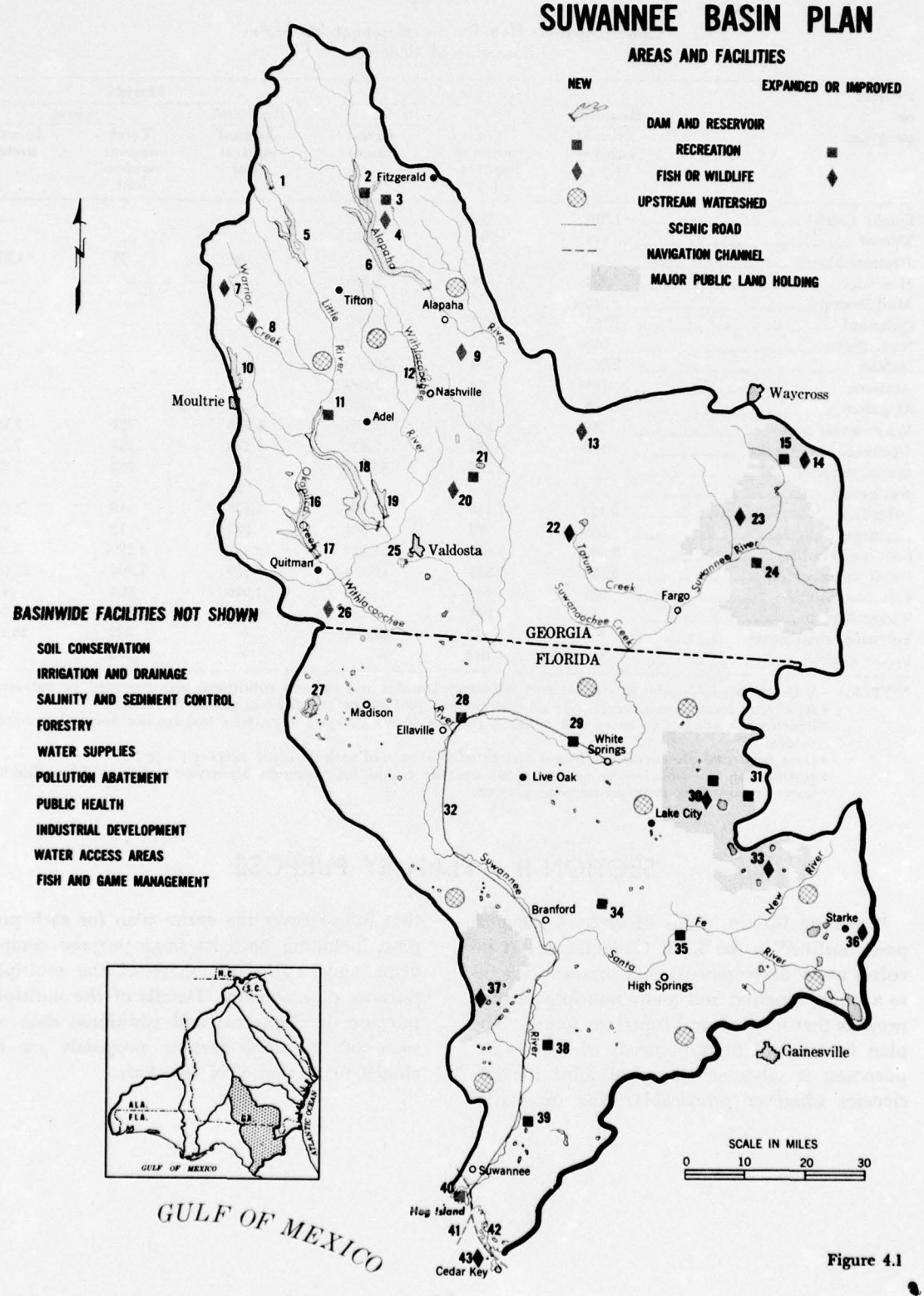

SUWANNEE BASIN PLAN
AREAS AND FACILITIES
NEW
EXPANDED OR IMPROVED
DAM AND RESERVOIR
RECREATION
FISH OR WILDLIFE
UPSTREAM WATERSHED
SCENIC ROAD
NAVIGATION CHANNEL
MAJOR PUBLIC LAND HOLDING
BASINWIDE FACILITIES NOT SHOWN
SOIL CONSERVATION
IRRIGATION AND DRAINAGE
SALINITY AND SEDIMENT CONTROL
FORESTRY
WATER SUPPLIES
POLLUTION ABATEMENT
PUBLIC HEALTH
INDUSTRIAL DEVELOPMENT
WATER ACCESS AREAS
FISH AND GAME MANAGEMENT
Fitzgerald
Tifton
Alapaha
Nashville
Moultrie
Adel
Waycross
Quitman
Valdosta
Fargo
GEORGIA
FLORIDA
Madison
Ellaville
White Springs
Live Oak
Lake City
Branford
High Springs
Starke
Gainesville
Suwannee
Hog Island
Cedar Key
Alapaha River
Little River
Withlacoochee River
Warrior Creek
Okapilco Creek
Tatum Creek
Suwannee River
Suwannoochee Creek
New River
Santa Fe River
SCALE IN MILES
0 10 20 30
GULF OF MEXICO
GULF OF MEXICO

Figure 4.1

TABLE 4.2

Comprehensive Plan for Development by States
(thousands of dollars)

Project or program	Georgia			Florida		
	Benefits[1]	Costs		Benefits[1]	Costs	
	Annual equivalent	Total annual equivalent	Investment	Annual equivalent	Total annual equivalent	Investment
Franks Creek[2]	1,016	319	4,470	---	---	---
Tifton[2]	424	290	4,570	---	---	---
Hixtown Marsh	---	---	---	68	65	1,270
Moultrie[2]	284	154	2,860	---	---	---
Mud Swamp	40	34	525	---	---	---
Quitman[2]	1,162	832	15,900	---	---	---
Nashville[2]	916	287	4,949	---	---	---
Shiloh[2]	2,062	922	16,200	---	---	---
Ashburn	145	68	1,090	---	---	---
Alapaha[2]	863	536	9,640	---	---	---
Water-access areas	550	160	2,195	1,783	721	7,525
Upstream watersheds	117	67	1,433	1,476	355	7,547
Water supplies	[3]	1,064	15,210	[3]	632	7,230
Navigation	---	---	---	11	9	70
Irrigation[4]	3,435	1,130	5,178	1,576	519	2,382
Drainage[4]	565	26	341	290	12	193
Soil conservation	2,303	1,496	13,120	2,557	1,190	3,800
Forest conservation	3,533	1,985	40,450	3,200	1,904	46,390
Fish and wildlife[4]	951	833	0	1,076	605	418
Recreation[4]	582	261	4,610	4,062	1,622	19,000
Pollution abatement[4]	[5]	952	26,940	[5]	437	13,160
Public health[4]	[5]	643	---	[5]	363	---

NOTES:
[1] Primary tangible only; intangible and secondary benefits and impacts considered are presented in narrative.
[2] Reservoirs located in Georgia, but an unidentified part of the benefits will accrue to Florida.
[3] Benefits are assumed to be at least equal to the cost of the cheapest alternative but are not assigned monetary values.
[4] Data presented are exclusive of costs and benefits associated with multiple-purpose projects.
[5] Justification is based largely on intangible benefits except for pollution abatement resulting from dilution water provided by multiple-purpose projects.

SECTION II – PLAN BY PURPOSE

Providing for the needs of each of the purposes outlined in the Study Commission Act involves many developments that produce benefits to a single function and many multiple-purpose projects that serve several functions jointly. The plan is designed to meet needs of the several purposes; it takes advantage of joint use efficiencies wherever practicable. The summaries that follow cover the entire plan for each purpose, including both its single-purpose components and its allocated share of the multiple-purpose developments. Details of the multiple-purpose developments and additional data for some of the single-purpose proposals are included in Section V of this Part.

TABLE 4.3

Plan by Purpose
(thousands of dollars)

Purpose	Benefits	Costs		
	Annual equivalent[1]	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Flood control	825	246	59	5,172
Water supplies	[2]	1,696	1,138	22,440
Navigation	11	9	7	70
Reclamation, irrigation, and drainage	6,727	1,941	1,452	13,464
Hydroelectric power and industrial development	----	----	----	----
Soil conservation	4,860	2,686	1,894	21,920
Forest conservation	6,733	3,889	1,774	86,840
Fish and wildlife	2,689	1,953	1,598	10,070
Recreation	11,830	4,935	2,604	68,280
Salinity and sediment control	[3]	[3]	[3]	[3]
Pollution abatement and public health	[4]	3,138	1,569	55,410
Other beneficial purposes[5]	----	----	----	----

NOTES:
[1] Primary tangible only; the intangible and secondary benefits and impacts considered are presented in narrative.
[2] Benefits are assumed to be at least equal to the cost of the cheapest alternative but are not assigned monetary values.
[3] Included with soil conservation, forest conservation, and flood control.
[4] Justification is based largely on intangible benefits, except for pollution abatement provided by multiple-purpose projects.
[5] Includes beach erosion control and hurricane protection for which additional studies are needed but no specific development proposed. Also includes low-flow augmentation which is analyzed as a part of the pollution abatement purpose.

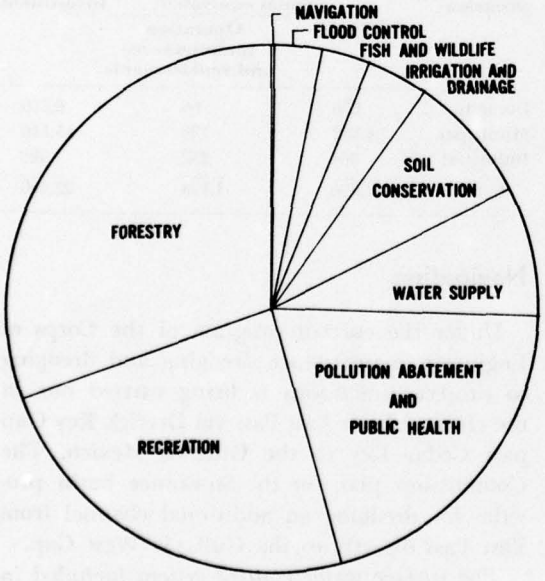


Figure 4.2 *Investment Cost to 2000.*

Flood Control and Prevention

The flood control program includes specific regulation for control of floodwater in Shiloh reservoir, minor flood control values in six

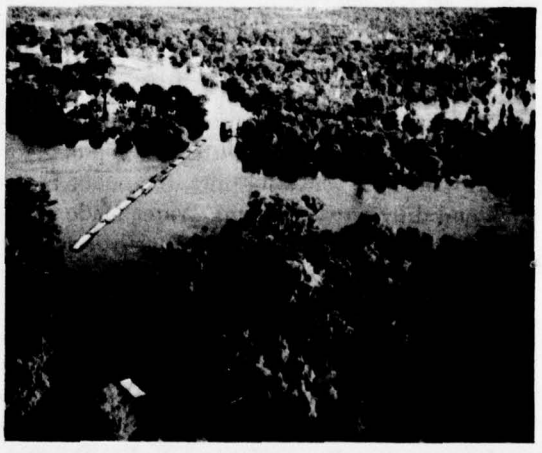


Figure 4.3 *Suwannee Flood at Dowling Park. Loaded Railroad Cars Were Left on Bridge for Ballast.*

other major reservoirs; channel control in upstream watersheds; and flood plain zoning where needed to insure that flood plain use is so managed that flood damages are held to a minimum.

The flood control projects would not eliminate flooding along the Suwannee or its tributaries, but would provide about the optimum amount of flood control. They would generally control floods of about 25-year frequency magnitude within their service areas and would have some beneficial effect on larger floods.

TABLE 4.4

Flood Control Benefits and Costs (thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Alapaha	23	23	9	400
Ashburn	2	1	....	24
Moultrie	2	1	....	30
Nashville	8	3	....	69
Quitman	5	4	1	86
Shiloh	40	35	7	756
Tifton	2	2	1	33
Upstream watersheds	743	177	41	3,774
Flood plain zoning*	....	....	....	....
Total	825	246	59	5,172

* Benefits and costs considered intangible—See discussion in Section V, of this Part.

Water Supplies

Programs for domestic, municipal, and industrial uses of water include the development or improvement of water supplies, treatment facilities, and distribution systems. Water made available from existing and proposed facilities would serve domestic needs for 5.7 million gallons per day, municipal needs for 70 million gallons per day, and industrial needs for 64 million gallons per day by 2000. It is expected that all water supplies will be from ground water, and no special provision has been made to provide surface supplies. Reservoirs included in the multiple-purpose plan could be used for water supplies, if needed, and the possibility of their future use for providing municipal or industrial supplies should be recognized when final financing and cost-sharing arrangements are being worked out.

Figure 4.4 *Elevated Storage Protects Water Quality and Provides Distribution Pressure.*

The benefits from providing a necessity like water supply is assumed to equal or exceed the cost as explained in Section V of this Part.

TABLE 4.5

Water Supplies Costs (thousands of dollars)

Project or program	Costs		
	Annual equivalent		Investment
	Total	Operation, maintenance, and replacements	
Domestic	270	66	6,810
Municipal	1,062	720	15,110
Industrial	364	352	520
Total	1,696	1,138	22,440

Navigation

Under the current program of the Corps of Engineers, maintenance dredging and dredging to project dimensions is being carried out in the channel from East Pass via Derrick Key Gap past Cedar Key to the Gulf of Mexico. The Commission plan for the Suwannee basin provides for dredging an additional channel from East Pass directly to the Gulf via West Gap.

The surface water control system included in the plan would augment low flows in the

Figure 4.5 *Recreation Boating on Suwannee River.*

Suwannee, Withlacoochee, and Alapaha Rivers to improve recreational boating opportunities. The benefits are included in the recreation analysis.

TABLE 4.6

Navigation Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
West Gap Channel	11	9	7	70

Reclamation, Irrigation, and Drainage

No project-type irrigation projects are planned for the Suwannee basin, but allowances have been made for the use of stored water for irrigation around the peripheries of major reservoirs. The anticipated irrigation use is small. As a result of regulations, streamflow will be more reliable, and there will undoubtedly be some increase in irrigation from streams. Stored water used by the irrigators would be paid for in accordance with its value.

Figure 4.6 *Water Level Control Benefits Both Cropland and Timberland.*

It is expected that, by the year 2000, individuals and small groups of farmers will be irrigating about 82,000 acres, or 53,000 acres more than were irrigated in 1960, primarily to improve product quality, provide for better control of marketing time, and otherwise improve their competitive market position. These developments would require about 46,200 acre-feet and 71,000 acre-feet of water by 1975 and 2000, respectively. About 90 percent of the required water supply would come from farm ponds, upstream watershed reservoirs, multiple-purpose reservoirs, and streams, with the balance coming from wells.

The drainage program includes individually financed facilities to serve 32,000 additional acres over that drained in 1960. Channel improvements included in the upstream flood control program would provide drainage benefits by draining valley lands and providing convenient outlets for drainage ditches.

TABLE 4.7

Irrigation and Drainage Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Irrigation[1]				
Programs	5,011	1,649	1,375	7,560
Reservoir storage[2]	11	9	2	164
Subtotal	5,022	1,658	1,377	7,724
Drainage[1]				
Individual farm	855	38	18	534
Small watersheds[3]	850	245	57	5,206
Subtotal	1,705	283	75	5,740
Total	6,727	1,941	1,452	13,464

NOTES: [1] Annual returns to farmers.
[2] Costs allocated to irrigation in nine projects.
[3] Costs allocated to drainage.

Figure 4.7 *Tobacco Harvest.*

High-value crops, such as tobacco and cotton, represent a large part of the net returns from the irrigated and drained acreage included in the plan. The acreages included in the plan have been projected with the knowledge of the current limitations imposed by ownership patterns and land use, institutional factors such as crop allotments, and the expected time lapse before cropland uses are determined more nearly by competitive economic conditions, even though the favorable returns-to-cost relationships may indicate a more extensive use of irrigation and drainage.

Hydroelectric Power and Industrial Development

There are no hydroelectric power projects proposed for installation in the basin. There is a possibility that constant releases from some of the proposed reservoirs could be economically used for power production by private companies, electric membership cooperatives, or other local groups. Such small installations could be made without adversely affecting other purposes if they are warranted when construction is undertaken. Most of the power needs of the area will continue to be served by sources outside the basin. Private power companies will probably construct additional steam-powered generating plants, in some cases using the assured cooling water supply provided by the proposed water control system. Private companies could also provide the needed high-voltage distribution lines.

No attempt has been made to identify or locate specific industrial enterprises that are expected to come into the Suwannee basin, but a significant part of the overall plan is directed toward establishing a general setting that will be attractive to new or expanding industrial plants. The industrial future of the basin is discussed in Section IV of Part One.

Soil Conservation and Utilization

Most of the soil conservation and utilization programs included in the plan involve individual or group actions by farm owners or operators and are largely financed by them. Some Federal aid is provided through technical assistance and through direct Federal participation in Public Law 566 and other programs.

The program for the basin includes protection of about 1,273,000 acres of land against all forms of soil deterioration, using the land within its physical capability, rebuilding eroded and depleted soil, reestablishing or improving protective covers, and increasing yields and farm and ranch income through proper land use and applied technology. Although specific areas for treatment have not been identified, it is assumed that farm managers throughout the basin will take advantage of the available opportunities to the extent necessary to meet production requirements.

TABLE 4.8

Soil Conservation and Utilization
Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent*	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Basinwide	4,860	2,686	1,894	21,920

* Annual returns to farmers.

Forest Conservation and Utilization

The forestry program involves some 4,705,000 acres of woodland scattered throughout the basin, including 119,000 acres in the Osceola National Forest.

The features of the forestry program are: (1) Technical assistance to private landowners for managing and harvesting timber and for applying recommended measures; (2) commercial and noncommercial thinnings to help bring

Figure 4.8 *Dense Timber Along Suwannee River near Its Mouth.*

Figure 4.9 *Paperboard Plant at Clyattville, Georgia.*

stands to operable conditions; (3) tree planting and site preparation for natural regeneration; (4) inspection for and reporting of insect and disease infestations to help reduce mortality losses; (5) water control management in woodlands for drainage and fire control operations, with drainage ditches gated where necessary to help eliminate standing surface water but at the same time maintain ground water levels and water bars; (6) forest fire protection by providing needed additional facilities such as towers and tractors and by increasing air observation and the number of personnel assigned to detection and suppression activities; (7) fencing woodland areas to control grazing and prevent cattle damage to tree seedlings; (8) road building for management and protection activities; (9) additional education and information programs; and (10) intensified forest research programs.

TABLE 4.9

Forest Conservation and Utilization Benefits and Costs (thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Basinwide	6,733	3,889	1,774	86,840

The forestry program would be largely developed, financed, and administered by timber owners with technical assistance from Federal agencies and some Federal participation in fire prevention and other aspects of the program.

Fish and Wildlife

The wildlife program consists of improvement of habitat; development of habitat within Okefenokee Swamp to encourage more use by waterfowl; development of new upland game management areas; development of small impoundments in the coastal marshes and river flood plains for waterfowl purposes; development of wildlife habitat throughout the basin by interested landowners; and expansion of current

Figure 4.10 *Fishermen Enroute To A Favorite Haunt in Okefenokee Swamp.*

activities in planning, education and information, and management and enforcement.

The sport fisheries program consists of improvement of existing lakes and streams; renovation and more intensive management of small impoundments; improvement of existing services and facilities for coastal fishermen; and expansion of current activities in planning, education and information, and management and enforcement.

The commercial fisheries program consists of expansion of existing operations; cultivation of shrimp, oysters, pompano, and other high quality food fishes; expansion of existing facilities; and acceleration of going programs. The program is based on the assumption that improved technology will tend to decrease unit costs in the future.

Large impoundments to serve multiple purposes would provide a total of about 55,000 acres of fishing water. Storage also would be allocated in these reservoirs for low-flow regulation which would improve conditions for fishing in the downstream areas. Small impoundments would provide additional fishing opportunities when public access and adequate management are provided. Better access to streams is also provided for in the plan.

The total program, by the year 2000, would provide annually some 868,000 user-days of hunting, 2,259,000 user-days of sport fishing, and would permit an annual catch of about 3,680,000 pounds of commercial seafood. The programs installed between 1960 and 2000 would provide, by the end of the period, for an increase in annual use of 440,000 user-days of hunting, 1,235,000 user-days of sport fishing, and about 1.9 million pounds of commercial seafood.

TABLE 4.10

Fish and Wildlife Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	OM&R	
Sport fisheries and wildlife	1,897	1,330	1,323	350
Commercial fisheries	130	108	106	68
Water-access areas*	140	137	67	1,960
Shiloh*	117	68	17	1,420
Franks Creek*	7	3	1	60
Tifton*	24	24	9	430
Hixtown Marsh*	44	43	11	905
Moultrie*	12	8	1	180
Mud Swamp*	16	13	5	230
Quitman*	72	54	15	1,080
Alapaha*	111	107	26	2,240
Ashburn*	26	20	8	340
Nashville*	93	38	9	807
Total	2,689	1,953	1,598	10,070

* Costs allocated to fish and wildlife.

Recreation

The recreation program is significant in the Suwannee basin. More than one third of the anticipated use of recreational facilities is expected to come from tourists and other nonresidents. In addition to providing for the social needs of the basin, the program includes a large element of business enterprise to supplement other business activity. Recreation is also an integral part of the overall basin plan that would provide facilities that will be attractive to industry and to older persons now living in the colder climates who are seeking pleasant retirement areas. These industries and individuals would build and maintain plants, homes, and other facilities that would help induce the new economic activities that are essential if the projected goals are to be met.

The recreation program involves three major types of developments: (1) The expansion of existing recreational areas to take advantage of the basic facilities that are already available; (2) the use of multiple-purpose projects to take advantage of their recreational potentials and at the same time share in the savings from joint uses of basic facilities; and (3) the development of new single-purpose recreational areas where the other types would not adequately meet anticipated needs.

The existing recreation developments are well distributed throughout the basin. There are 16 major sites that include 2 high density use areas at Crystal Lake and Okefenokee Swamp Park; 7 general use areas at local or State parks; 3 natural environment areas at Banks Lake and 2

national wildlife areas; 3 historic and cultural sites at State memorials; and the primitive area of Okefenokee Swamp.

Recreational developments are provided at 10 multiple-purpose water storage projects. Under present conditions, inland bodies of water available and suitable for recreation use in the northern part of the basin are scarce. The proposed reservoirs and other developments would provide for a well-balanced program to meet future needs of the area, including additional small water bodies for swimming and other intensive uses and larger reservoirs to accommodate large motorboats, sailboats, and water skiers and other users.

The 27 access points involving recreational use would be located at existing lakes, small reservoirs, or along streams where needed with the most significant concentration in the upper Santa Fe basin. The size and type of development at each site would be adjusted to suit the physical potentialities of the site and the needs of the area.

The existing and proposed facilities included in the plan would provide for a projected need of 15 million user-days by the year 2000. Development of existing and new facilities would accommodate about 2,750,000 user-days at multiple-purpose impoundments and 12,250,000 user-days at general outdoor, natural environment, and cultural areas.

Projects and programs for recreation development during the period 1960-2000 would provide for 13,924,000 user-days, including 4,084,000 user-days from expanded facilities at existing areas and 9,840,000 user-days at new areas.

TABLE 4.11

Recreation by the Year 2000
(thousands)

Project or program	User-days
Existing areas, including expansion	5,160
Multiple-purpose reservoirs	2,750
Water access multiple-purpose areas	1,640
New single-purpose developments	*5,450
Total	15,000

* Includes 800,000 user-days attributable to the Gulf Coast Improvement project evaluated in Appendix 6, Ochlockonee Basin.

TABLE 4.12

Recreation Benefits and Costs
(thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	OM&R	
Existing recreation[1]	2,505	785	475	13,540
New recreation	2,139	1,098	670	10,070
Water-access areas[2]	[3]2,193	744	464	7,760
Shiloh[2]	1,501	608	269	9,400
Franks Creek[2]	1,009	316	160	4,410
Tifton[2]	273	148	74	2,040
Hixtown Marsh[2]	23	21	7	345
Moultrie[2]	184	93	42	1,465
Mud Swamp[2]	23	20	9	281
Quitman[2]	812	575	210	10,570
Alapaha[2]	500	310	121	5,230
Ashburn[2]	73	25	13	334
Nashville[2]	595	192	90	2,835
Total	[3]11,830	4,935	2,604	68,280

NOTES: [1] Proposed expansion of facilities.
[2] Costs allocated to recreation.
[3] Excludes $590,000 assigned for the water quality control aspects of the pollution abatement and public health functions.

Salinity and Sediment Control

Saline soils in the Suwannee basin are limited almost entirely to the coastal marshes that involve comparatively small acreages because of the limited coastline of the basin. There is no foreseeable need for more land for agricultural uses before the year 2000, so the marshes will continue to be most useful as fish and wildlife areas, and no program for their conversion is anticipated. Saline water is an impending problem for the city of Cedar Key, and is recognized in the plan for municipal water supplies.

Sediment control is an integral part of the small watershed and other agricultural programs and is a recognized part of highway construction work. The large and small impoundments included in the basin plan for other purposes would act as sediment retention pools. The forestry and other land-management programs would tend to reduce sediment problems. The sediment control value of these developments is recognized, but the benefits and costs that might properly be allocated to sediment control

have not been separated from those for the other purposes.

There are no salinity and sediment control projects identified as such in the plan.

Pollution Abatement and Public Health

There is pollution from municipal wastes, industrial wastes, decaying swamp matter, and agricultural fertilizers and insecticides in many streams of the Suwannee basin. To treat the present wastes properly would require over $13 million in treatment facilities and sewerage systems.

The total pollution abatement program for the 1960-2000 period consists of 66 new or extended sewerage systems, 51 new or enlarged municipal and industrial waste-treatment facilities, and provisions for releases from 7 reservoirs to augment low flows where uncontrolled minimum streamflows are not adequate to assimilate treated wastes from 10 towns.

TABLE 4.13

Pollution Abatement and Pubilc Health Benefits and Costs (thousands of dollars)

Project or program	Benefits	Costs		
	Annual equivalent	Annual equivalent		Investment
		Total	Operation, maintenance, and replacements	
Municipal pollution treatment	[1]	1,214	295	35,750
Industrial pollution treatment	[1]	175	78	4,350
Vector control	[1]	204	204	....
Refuse disposal	[1]	792	792	....
Air pollution monitoring	[1]	10	10	....
Water quality control[2]				
Alapaha	227	94	31	1,730
Ashburn	43	21	7	380
Moultrie	85	51	9	1,170
Nashville	219	54	9	1,230
Quitman	272	198	49	4,150
Shiloh	402	210	44	4,600
Tifton	124	115	41	2,050
Total	[1]	3,138	1,569	55,410

NOTES: [1] Justification is based largely on intangible benefits.

[2] Includes dilution water for specific local needs and low-flow augmentation for general stream improvement.

In the Suwannee basin, where recreation and industrial development are so very important to future economic development, water quality and public health protection assume even greater than normal importance. Slow-moving waters, such as are found here, are particularly subject to pollution problems. Pollution abatement and low-flow augmentation now would constitute insurance for future usefulness as well as for immediate purpose and would provide an important incentive for further industrial developments.

Public health programs include basinwide measures for vector control, solid-waste disposal, and radiological monitoring. For vector control, the plan assumes a continuation and expansion of existing programs for sanitation, better water management, and spraying. Reservoir operations provide for short-range fluctuations as necessary to prevent larvae development. The small investment costs involved are reflected in the annual equivalent costs. Costs for sanitary landfill are treated in the same manner with investment in the land and equipment required for disposal and landfill operations accounted for only in annual equivalent costs. Land created by the fills will probably have value in excess of the cost of the original land involved.

Other Beneficial Purposes

Beach Erosion Control and Hurricane Protection

A cooperative survey should be made of the influences of tides, offshore currents, hazards from hurricanes, winds, and places of immediate danger. In this connection, use should be made of the results of Corps of Engineers studies which cover most of the hurricane protection problems in the study area.

The existing hurricane warning system should be modified as required to serve the area better. Evacuation routes should be established over bridges and causeways, and a plan for using existing ferries and other boats for emergencies should be prepared for use of Cedar Key and for out-of-the-way places as the need develops.

Provision should be made for installing and enforcing zoning and building codes, auxiliary power supplies, and determining the needs for

protective seawalls or similar structures.

Beach erosion control plans should be coordinated with plans for channel improvement and maintenance, hurricane protection, recreation, fish and wildlife proposals, and other proposed improvements in the area.

Other Purposes

The plan provides for continuing programs for obtaining topographic and geologic mapping, hydrologic data, data on water quality and water use, and on land-use changes to improve and add to the store of basic data on the area resources.

The forecasting of streamflow is essential in the proper management of water resources. Flood forecasting is well known for reservoir operation and for warnings in areas unprotected by physical control of floodwaters. Future use and regulation of streams will require forecasts of flow, both high and low, as far in advance as is practicable. All river-related purposes such as recreational boating and fishing, navigation, hydropower operation, water supply, pollution abatement, public health, irrigation, and flood control are benefited by advance information as to the expected flows. The costs of forecasting are relatively small and are included in the overall project and program costs. The benefits are also included in overall figures, on the assumption that the best possible forecasts will be available for project and program operation.

Low-flow augmentation is needed, particularly in the upper portion of the Suwannee basin. In order to recognize this general need, and to analyze it within the limits of the overall benefits produced by the comprehensive plan, a portion of the downstream recreation benefits associated with the seven reservoir storage projects were assigned to low-flow augmentation. These assigned benefits were then transferred to the pollution abatement purpose and analyzed as a part of that purpose. The allocations to low-flow augmentation associated with these transferred benefits are identified in Section V of this Part.

Rural zoning could eliminate or alleviate future problems in many areas of the basin. Zoning is not included in the plan as an identified purpose. It is, however, recognized as a need and suggested as a proper and desirable function of local governments.

SECTION III – IMPACTS OF THE PLAN

Economic

The comprehensive plan of development has been formulated and evaluated principally on the basis of primary tangible benefits. These benefits would be created by development of the proposed projects and programs and are the more obvious measures of justification.

Water and land resource development also creates certain far-reaching benefits not normally evaluated in monetary terms. Many times, new uses occur, after development, that have a tremendous impact on the immediate areas involved. The greater use and perhaps the greater value from projects sometimes relates to those benefits, primary or secondary, tangible or intangible, that are not fully recognized or claimed in the monetary justification.

In the Suwannee basin, significant values will unquestionably stem from unidentified primary and secondary benefits, tangible and intangible.

Development of the water and land resources in the Suwannee basin is essential to continued economic development in the basin, and would stimulate economic activity beyond the basin limits. Inasmuch as most of the financing and cost sharing of the proposed developments, as well as the initiative for development, must be borne by the local interests, it is important that impacts of the comprehensive plan in the basin area be recognized and considered when projects and programs are being selected for implementation.

Impacts related specifically to individual projects and programs are discussed in Section V of this Part. Some general impacts, by purpose, are discussed in Section II. Other broad impacts are covered in the following paragraphs.

Flood Control

Floods cause frequent and sometimes damaging problems in the Suwannee basin. The large reservoirs, upstream watershed developments,

and farm ponds will help protect areas subject to flooding. Greater safety from floods would make the entire area more attractive to widespread economic expansion of business and manufacturing and permit more intensive use of land for agriculture and other purposes.

Industrial Development

Capital expenditures for industrial expansion anticipated in the basin will average about $15 million annually. An annual average of about 350 new jobs is expected to be created in manufacturing, and approximately 1,000 new jobs annually are expected in service, trades, and professional categories.

New manufacturing employees and those in supporting industries and trades will buy new homes, cars, furniture, appliances, food, drugs, and services. They will also pay taxes and demand governmental services for their tax dollar. So, with economic progress comes community demands for services such as schools, highways, water and sewerage facilities, and police and fire protection. Communities that keep abreast or even ahead of these demands are the communities that are going to realize the fastest growth.

The present agricultural and forestry lands, while contributing much to the areas overall economy, provide a relatively low per-acre base for real-estate tax revenues. The rural counties are in dire need of additional revenues. The industrial and other developments of the comprehensive plan would provide for more intensive land use, thus adding to the tax base and to the tax revenues.

The economic impact of industry does not stop when it reaches the city limits or even the basin boundaries. Its effects are far reaching, with the larger trading centers such as Valdosta, Lake City, Jacksonville, and Gainesville feeling the results of this activity.

Irrigation, Drainage, Flood Prevention, and Soil Conservation and Utilization

In the past, the Suwannee basin has been dependent on agricultural activities. Agricultural employment is presently nearly double manufacturing employment. Although the order of importance is expected to reverse by 2000, agriculture will continue to play an important role in the basin for the next 40 years. Most of the basic trade, service, and financial activities in the Suwannee basin and the towns and cities themselves owe their existence to agriculture and forestry.

As a source of raw materials to sustain the food-processing industries, agriculture will continue to hold importance, and secondary benefits from agricultural development will have real and lasting effects on the basin communities. It has been estimated that, for every dollar of net income derived from primary industries, including agriculture, there is at least an additional $1.00 to $1.50 income generated in the community. This effect is shown in increased business activity in trades, services, and financial establishments.

By 2000, the basin farmers probably will be spending about $13 million for feed, $4 million for livestock, $4 million for seed, $22 million for fertilizer and lime, $24 million for repairs and maintenance, and $15 million for labor, for total production expense of $130 million annually. Their income over and above these expenses is estimated to be $125 million. Most of this money will be spent in the basin.

Only the portion of the total agricultural program involving soil conservation and utlization, reclamation, drainage, irrigaton, and upstream watershed improvements is included in the plan. The benefits, primary and secondary, from these programs will create a portion of the economic impacts of the total agricultural program. They, like the impacts from other aspects of the agricultural program, will have real and lasting effects on the basin communities. Benefits will accrue through improved efficiencies of farm operations; reduction of turbidity of many streams; prolongation of the useful life of surface reservoirs; some alleviation of flood and sediment damage to roads, bridges, roadfills, livestock, and real and personal property; improved wildlife habitat and recreation facilities; and abatement of stream pollution. These programs also facilitate proper utilization of agricultural lands by protecting land from erosion, permitting more intensive utilization, and contribute toward an adequate agricultural and nonagricultural water supply for the people of the basin.

Forest Conservation and Utilization

About 68 percent of the Suwannee basin is in woodlands with over 35 percent in small private holdings. Timber production in the basin should be doubled by 2000 and a large share of this increased production is expected to be achieved on small holdings.

This increased production is of great importance to the basin because of the raw materials needed to advance the manufacturing potential. The pulp and paper industries as well as the lumber and wood products industries hold promise for employment growth. Increased employment will be forthcoming from reforestation, management, and fire protection. More employees are also expected to be needed for harvesting and transporting of the timber products and raw materials. All of these activities can be of great importance to the smaller rural communities. They mean increased expenditures for equipment, supplies, taxes, services, payrolls, and housing.

In addition, the forestry program would improve the condition of the soil and reduce erosion and storm runoff. Recreation possibilities would be enhanced, and better fish and wildlife habitat would be provided.

Fish and Wildlife

The expenditures of sportsmen in the project areas as well as in the towns or cities where they reside add much to the basin economy. Additional employment opportunity would be afforded by many small businesses engaged in operation of fishing and hunting camps and in services and sales of food, gasoline, arms and ammunition, fishing tackle, live bait, and other sporting goods and supplies.

Table 4.14 summarizes the percentage of expenditures which might be expected from hunting and fishing in the basin. These are compiled from national averages and are only illustrative. Dollar expenditures vary widely from a few cents per day for the local resident to $100 or more for the vacationing sportsman. The national average probably runs between $5 and $6 per day.

Less tangible are the benefits derived by general enhancement of the recreational opportunities afforded by a given locality. The growth of many towns and cities in this portion of the Southeast will depend to a great extent on their attractiveness and proximity to lands and waters affording good hunting and fishing.

TABLE 4.14

Percentage Distribution of Expenditures for Hunting and Fishing, 1960

Expenditure item	Hunting	Fishing
Food	7	8
Lodging	2	2
Transportation	15	14
Equipment	49	48
Licenses, tags, permits	5	2
Leases, fees, other	22	26
Total	100	100

The commercial fishing industry generally is plagued by the vagaries of weather, seasonal fluctuation of supply, precarious market conditions, lack of good conservation practices, and competitive products. As a result, this industry is not attracting energetic young men. The benefits which could be realized, however, are of such magnitude as to justify a vigorous effort toward attracting new men into the industry.

Secondary benefits include increased employment in the fishing and seafood industries and in boat building, boat maintenance, and boat-supply enterprises. More services would be required; and sales of food, gasoline and oil, fishing supplies, and other equipment would increase.

Recreation

Outdoor recreation activities create economic stability of many areas of our Nation, including major parts of the Suwannee basin. Several segments of industry, such as boat building, recreation equipment, and camping equipment, that are almost wholly dependent upon outdoor recreation pursuits have evidenced phenomenal growth in the last decade. As leisure time and per capita income increase, these segments will continue to expand.

Outdoor recreation produces many primary benefits, some of which are not easily expressed in monetary terms. Recreation provides the healthful exercise necessary for physical fitness.

It promotes mental health and offers esthetic values.

Recreation produces secondary benefits, too. These secondary benefits are reflected in the economy of the area, the community, and the Nation. Some of these secondary benefits are: (1) Stimulation of in-migration of persons looking for a pleasant place to live; (2) development of business activity in areas within, adjacent to, or enroute to recreation areas, increasing retail trade, and new construction; (3) stimulation of travel and travel expenditures; (4) stimulation of business activity relative to the manufacture of recreation equipment; (5) increased property valuations in and around recreation areas; and (6) increased miscellaneous net tax revenue after deducting increased governmental expenditures for needed governmental services.

Surveys of these secondary benefits have been made in many areas, but the effectiveness of the surveys is dependent upon how they were developed and for what purpose. Some of the surveys give individual expenditure estimates running from $4.00 to $7.00 per day and breakdowns of expenditures for food, lodging, and transportation. A recent Georgia survey determined that about $4.00 are spent daily by the recreationist. These expenditures are reflected in the economic activities mentioned above. Even if this rate does not increase in the next 40 years, the 15 million user-days that recreationists are expected to spend in the Suwannee basin annually by 2000 would entail an outlay on their part of about $60 million, or half as much as the expenditures for agriculture. Many of these recreationists would be persons passing through, or those who moved into the basin largely because of recreation opportunities.

Water-based recreation is of special importance in outdoor recreation today. Reservoirs, lakes, coastal areas, and unpolluted streams generate more recreational activity than any other inducement. One recent study was made in the Arkansas-White-Red River Basins of selected counties with significant reservoir shorelines in contrast with selected counties in the same vicinities without reservoirs. The 10-year study showed an increase in per capita income of 57 percent in the reservoir counties as compared with 23 percent in the nonreservoir counties. Bank deposits increased 57 percent in the reservoir counties and 40 percent in the others. Tax returns were up 64 percent in the reservoir counties and only 4 percent in the nonreservoir counties. Also significant in the reservoir counties was an increase in investment in overnight lodging facilities, annual expenditure on private home construction, and new school construction. Counties in the same areas without shorelines showed little increase in these activities.

While all the economic gains in those reservoir counties cannot be directly attributed to the presence of new lakes, it is evident that the new recreational activities had a pronounced effect. The reservoir counties are better off by nearly all economic yardsticks. However, these counties were comparatively depressed prior to the construction of the reservoirs. The impact of the recreation dollar was more dramatic in this situation than it would be in an area of greater economic activity.

Pollution Abatement and Public Health

Clean surface water enhances the well being of people and is a factor which influences people as to their choice of place of residence, employment, and recreation. Thus, this is important in sustaining a healthy environment, and in attracting others to the basin.

Pollution abatement is frequently necessary to realize fishing, hunting, and recreational opportunities. In turn, clean streams improve land and property values which have a great impact on economic development. Industries are particularly interested in establishing new plants in areas where pollution problems can be handled effectively and where provisions have been made for orderly expansion of public facilities needed for pollution abatement.

Public health programs for control of vectors, mainly mosquitoes and gnats, are also very important. The coastal areas of the Suwannee basin with their tidal marshlands, and the entire length of the basin with its numerous ponds and depressions, afford breeding places for mosquitoes and other vectors. Various agricultural practices such as raising hogs and chickens may encourage the breeding of flies, if not properly carried out. Much of this can be eliminated by

better drainage and better sanitary conditions. Control of these undesirable vectors could mean the difference in some places between success or failure in the efforts to improve the area economy.

Other Economic Impacts

Other noteworthy economic impacts relate to several or all of the functional programs.

Land enhancement impacts—Land and water resources improvements have not been planned specifically for enhancement of land. However, the land enhancement benefits that would result from reservoir construction and certain other projects would be considerable. Waterfront property, particularly that suitable for homesites and recreational and industrial development, is generally marketable at a higher value than nonwaterfront property with all other factors being equal. Land that was previously woodland or farmland is subdivided into more expensive lots. Other areas become important for industrial property because of stable, ample, and unpolluted water supplies. Many public costs are associated with more intensive land use and rising land values, however, so the entire amount of these values cannot be looked upon as net benefits. Also offsetting the enhanced values of shoreline property are the production losses from the former uses of the inundated land. These losses are not always adequately reflected as a cost in the land prices used in preparing cost estimates.

Rapid development of lakeshore property for recreation and commercial use has followed reservoir development throughout the Southeast River Basins area. Reconnaissance studies in the Lake Sidney Lanier area of north Georgia suggest that property values in the vicinity of the reservoir, which is used extensively for recreation, have increased tenfold during the first 10 to 12 years of development.

This is not to claim that land enhancement values at all reservoir projects outlined in the comprehensive plan would be of the same magnitude. Several factors that influence land enhancement values are:

(1) Proximity to urban population,
(2) shoreline topography,
(3) fluctuation in water level,
(4) water quality,
(5) accessibility and shoreline ownership, and
(6) size of water body.

In the future, as waterfront property becomes more scarce as a result of increases in population and leisure time, the enhancement of land would be an even greater secondary effect of water project development.

Impact from tax revenues—Increased tax revenues usually come as a result of increased economic activity, increased land and resource productivity, more intensive land use, and more real property. Counties that today have a uniform or declining economic activity, low value forest and farm productivity, poor land use, and little new construction are not in a favorable position to realize greater tax revenues. Even tax equalization is difficult under such situations. Without sufficient tax revenues, government efficiency and extension of community services are almost impossible.

Development of projects and programs envisioned in the comprehensive plan would do much toward alleviating this situation. Increased economic activity would follow as a result of the implementation of the projects and programs. The forestry program would result in increased forest productivity. The soil conservation, reclamation, irrigation, and drainage programs would mean increased farm productivity. Increased economic activity would result in more residential and business construction. All of these effects coupled with judicious tax equalization and governmental administration would mean increased tax revenues and better governmental services.

Inundated reservoir lands and lands taken out of production for other projects and purposes may create a loss in taxable property to the county tax rolls. However, these tax revenue losses do not necessarily have to be permanent. In the case of reservoir lands, proper development and management of the shoreline area and the resulting land enhancement and new construction would practically always soon outweigh the tax losses. In the previously mentioned study of selected counties following reservoir construction in an underdeveloped area in the Arkansas-White-Red River Basins, it was found that tax revenues were up 64 percent at the end of 10 years. Nearby counties without reservoirs in-

creased less than 4 percent during the same period.

Impacts from construction activities—The construction of storage works and other facilities will provide an economic stimulus to the local area during the construction period. This is brought about by the temporary influx of workers for the project who desire housing, food, services, and entertainment and by the fuller employment and higher payment to workers from the local labor force. Most of this economic activity, stemming from wages and salaries, is felt locally.

It has been estimated that about 60 percent of the total construction expenditure is labor cost. The remaining 40 percent is for materials, equipment, maintenance, service, etc., and most of these costs would affect a larger area—even the national economy—and would be less impressive to any individual locality.

It should be remembered that the local community is subject to substantial cost as a result of increased population engaged in construction, and this cost must be considered in appraising the benefits. However, if properly planned, the water, sewerage, school, and other facilities provided for construction workers can often be converted to permanent use and thus become long-range assets.

Impacts from migration—A high birth rate, a relatively dense population for an agricultural area, and limited employment opportunities have produced in the Southeast River Basins an extremely mobile population. The resulting out-migration and regional urbanization have been good, in many respects, as safety valves which have prevented population pressures from reaching even more undesirable proportions in the rural areas. However, migration since the 1930's has also brought about a loss to the area, because these out-migrants represent lost manpower and lost expenditures to the area for the rearing, educating, and training of the migrants.

At the same time, the Southeast River Basins area has evidenced a growing amount of in-migration. Generally, the amount of education, training, and income represented on a per capita basis by this group has been relatively higher than that for the out-migrants. As a result, the economic losses from out-migration have been tempered by the economic gains from in-migration.

A migration projection study was made for the Southeast River Basins area as a whole. The results of that study did not provide basin data to show the economic effect of migration on the Suwannee basin. However, the trends indicated by the study are believed to be applicable to the basin.

The study shows that during the period 1960-75 out-migrants should continue to outnumber in-migrants but not to the extent which was evident from 1930-60. Because the in-migrants are expected to be better educated and skilled than the out-migrants, the area should evidence a modest gain when comparisons are made of the cost of rearing, training, and educating the migrants. During the period of 1975-2000, this economic gain should be even greater because the in-migrants should then begin to outnumber the out-migrants.

Another comparison was made of the personal income of the in-migrants and out-migrants. Under this comparison, the period 1960-75 shows an economic loss but not nearly as great as that evident during the 1930-60 period. During the period 1975-2000, the area should start to gain economically in this comparison of personal income.

Impacts to redevelopment areas—There are six counties lying wholly or partially in the basin that have been designated redevelopment areas as of April 20, 1962, under Section 5 (b) of the Area Redevelopment Act of 1961. These counties have been designated for various reasons such as low median family income and low farm family income.

The Redevelopment Act is directed toward creating needed new employment opportunities through the development of facilities and resources. The program offers five broad types of assistance: Loans for industrial and commercial projects, loans and grants for public facilities, technical assistance, occupational training, and retraining subsistence payments. Many Federal and State agencies cooperate under the provisions of the Act. Also, many colleges and universities lend technical assistance to eligible areas under this program.

Some of the projects and programs proposed

for the basin should help remedy the conditions which existed to cause counties to be designated redevelopment areas. For instance, the food and fiber program would improve per capita farm production and income throughout the basin. The commercial fisheries program would increase employment and income in the coastal area. The projects to provide more and better recreational opportunities would increase per capita income as well as provide additional employment in the vicinity of the individual projects. The reservoir and dam construction projects would create temporary employment during the actual construction phase.

Physical

The planned program would provide sustained flows downstream from storage works, thus eliminating dry streambeds and periods of extremely low flow. The changes, however, are not of such magnitude as to change the basic stream regimens. Some floodwater would be stored for later use, and flood durations and peaks would be decreased in many areas. The precise timing of flood peaks, and their concentrations, have not been studied in detail, however, and it is possible that in some areas instantaneous flood peaks might be increased as a result of the loss of valley storage.

Very little consumptive use of water is planned, so average annual discharges from streams will not change materially. Increased groundwater pumping, in excess of consumptive use, would probably provide a small increase in surface flows. Evaporation losses from reservoir water surfaces is expected to about equal transpiration and evaporation losses from the areas inundated.

The effects of drainage, land management, urbanization, road construction, and other cultural improvements would affect runoff patterns in some localities. In the aggregate, these effects would tend to compensate and are expected to have little effect on the flows of major streams.

Surface water quality should be improved in areas where low-flow augmentation is provided, and should not be impaired in other areas if the proposed treatment facilities and rural zoning regulations are provided. Salt-water intrusion should not become a problem in the basin, except for the Cedar Keys area where new water sources can be provided.

The productive capacity of the land in the basin will not be reached during the 1960-2000 period, so changes in land use should not create significant problems beyond the local area immediately affected.

The types of developments that are proposed are limited to those that will not impair the esthetic beauty of the basin. The reservoirs and other facilities should complement the areas natural attractions.

SECTION IV – PLAN IMPLEMENTATION

Cost Sharing

Resource development costs should be shared so as best to serve the public interest, thereby: (1) Encouraging sound resource development and economic and social stability and growth; (2) promoting maximum efficiency in use of private and public funds; (3) obtaining an equitable relationship between the incidence of costs and benefits; (4) preventing avoidable waste, unwarranted windfall gains, and undesirable competition; (5) encouraging desirable types and sizes of enterprises; (6) securing consistency between the various purposes of resource development; and (7) promoting public understanding and cooperation in resource development.

Two types of costs are shown in Table 4.15 for cost-sharing analyses: (1) Investment costs, which include all of the costs of project construction, including lands and rights-of-way, estimated for the period of development through the year 2000; and (2) operation, maintenance, and replacements costs, shown as annual cost, and estimated on the basis of development at the year 2000. These costs are divided into those expected to be borne by the Federal Government and those to be borne by non-Federal interests. Before final cost-sharing arrangements are made, the non-Federal portion will need to be further subdivided among State, local, and private participants. The figures shown are illustrative and will probably be changed somewhat when detailed plans are made.

Operation, maintenance, and replacements costs for use in cost-sharing determinations have been based on full use of the facilities that are specifically proposed. The comprehensive plan is designed to meet needs to the year 2000, so additional needs, costs, and benefits that may develop after the year have not been evaluated. This does not ignore or preclude the possibility of adding facilities after the year 2000 to the then existing projects and programs to meet additional needs. Since the ultimate need during the period studied will not normally develop until the year 2000, the ultimate operation, maintenance, and replacements costs for the facilities included in the plan is shown as "OM&R at year 2000."

Financing

In 1960, Federal, State, county, local, and private expenditures for resource development in the Suwannee basin totaled about $13.5 million. This was equivalent to nearly 4 percent of the basin total personal income. An estimated 15 percent of this expenditure was for training, technical aid, and other items not included in the comprehensive plan. This left the equivalent of 3.4 percent of the personal income available for types of endeavor corresponding to those in the plan.

The projects and programs covered by this Report involve some private expenditures and some items of public expenditure which have

TABLE 4.15

Cost Sharing in Suwannee Basin Comprehensive Plan

Purpose or project	Investment costs					Annual operation, maintenance, and replacements costs at year 2000				
	Total ($1,000)	Federal ($1,000)	Federal (pct.)	Non-Federal ($1,000)	Non-Federal (pct.)	Total ($1,000)	Federal ($1,000)	Federal (pct.)	Non-Federal ($1,000)	Non-Federal (pct.)
Purpose*										
Flood control	5,172	3,105	60	2,067	40	59	14	23	45	77
Water supplies	22,440	—	—	22,440	100	2,254	—	—	2,254	100
Navigation	70	60	80	10	20	7	6	95	1	5
Irrigation	7,724	2,011	26	5,713	74	1,377	2	—	1,375	100
Drainage	5,740	1,435	25	4,305	75	75	—	—	75	100
Soil conservation	21,920	6,580	30	15,340	70	1,894	—	—	1,894	100
Forest conservation	86,840	30,390	35	56,450	65	2,210	665	30	1,545	70
Sport fisheries and wildlife	10,002	2,949	30	7,053	70	2,378	21	1	2,357	99
Commercial fisheries	68	41	60	27	40	196	118	60	78	40
Recreation	68,280	12,273	18	56,007	82	3,306	298	9	3,008	91
Pollution abatement	55,412	15,449	29	39,963	71	925	—	—	925	100
Public health	—	—	—	—	—	1,006	41	4	965	96
Project*										
Franks Creek	4,470	2,676	60	1,794	40	173	35	20	138	80
Tifton	4,570	1,272	28	3,298	72	127	18	14	109	86
Hixtown Marsh	1,270	1,011	80	259	20	18	12	67	6	33
Moultrie	2,860	767	27	2,093	73	58	8	14	50	86
Mud Swamp	525	298	57	227	43	15	3	20	12	80
Quitman	15,900	3,610	23	12,290	77	305	47	15	258	85
Nashville	4,949	1,138	23	3,811	77	110	18	16	92	84
Shiloh	16,200	4,240	26	11,960	74	343	58	17	205	83
Ashburn	1,090	285	26	805	74	29	4	14	25	86
Alapaha	9,640	2,153	30	7,487	70	191	30	26	161	74
Water-access areas	9,720	3,888	40	5,832	60	531	80	15	451	85
Upstream watersheds	8,980	3,378	38	5,602	62	98	—	—	98	100

* Costs for purposes and projects are not additive. Costs of projects are also included as part of the cost by purpose.

been made since January 1, 1960, the starting date used for the evaluation. During the period of analysis, the annual personal income in the basin is expected to be about $566 million by the year 1975, and about $1,184 million by the year 2000. If the current rate of resource expenditures in relation to personal income is continued to the year 2000, such funds would be more than adequate to accomplish the plan.

The annual rate of expenditure needed to accomplish the developments of the plan, in total and in relation to personal income, is higher than the previous or current rate during the first 10 to 15 years and diminishes during the last 25 years. This is due to: (1) An immediate demand for facilities not now developed; and (2) the omission of some developments which undoubtedly will be needed in the latter portion of the period 1975-2000, but which were not planned for because the long-range projection of economic conditions used in establishing resources needs were not carried beyond the year 2000.

During the first 10 to 15 years of plan implementation, there will be, therefore, need for additional financing at a rate higher than that prevailing in and prior to 1960 in order to provide for an adequate level of improvements consistent with the needs and opportunities within the basin.

As an example, studies indicate that the Commission plan to expedite developments now in demand involves capital outlay and operation, maintenance, and replacements costs during the period, 1960-75, which would exceed the normal increase of these expenditures at all levels of private and governmental activity, by raising the annual expenditures about $3 or $4 million above the amounts which would normally be available for work in this basin. The exact amount would depend upon the promptness in implementing the early action phase of the plan.

The Federal expenditure rate in the Suwannee basin is expected to be increased, thus providing part of the needed funds. The remaining funds for this acceleration period will have to come from non-Federal sources such as State and local governments, and private individuals and enterprises. In the case of State and local government, the additional funds should come partially from bond issues, development funds, authority financing, etc., in order to avoid overstressing the current tax base and to enable funds in the hands of private individuals and enterprises to be currently available for the private components of the plan.

Responsibility

The comprehensive plan for the Suwannee basin is a combination of projects and programs formulated to meet the needs of the people for land and water resource development. In most cases, studies have not been carried beyond the reconnaissance level and thus additional detailed planning is required prior to implementation of the plan. The authorizing Act specifically provides that the Commission plan shall not include final project designs and estimates.

The responsibility for initiating the plan basically must rest with the State and local interests. Even in those fields where a Federal agency is normally the organization which actually performs the detailed planning and construction, the impetus for the planning study must originate with those whom the programs and facilities will benefit.

The responsibilities for initating and carrying out developments, as suggested in Table 4.16, are made in accordance with the following criteria.

(1) If an existing project or program is to be expanded by the addition of facilities or acceleration of activity, then the assignment of major responsibility for planning, construction and/or development, and operation is to the agency already having jurisdiction over the existing project or program. For example, if additional facilities are to be provided at a project which is already a Federal project under the administrative supervision of the Corps of Engineers, then this agency would be given major responsibility for planning and construction even though the work might be actually done by other Federal or non-Federal entities.

(2) Where additional facilities are proposed at a project already under non-Federal jurisdiction, then the non-Federal interest is assigned the major responsibility.

(3) Non-Federal programs such as forestry, soil conservation, recreation, fish and wildlife,

reclamation, drainage, irrigation, public health, and pollution abatement would continue under non-Federal sponsorship except where such programs apply to national forests, military reservations, and other Federal holdings. Where a clear-cut conclusion is not readily apparent, then selection is made on a case-by-case basis, giving due weight to the pertinent circumstances.

(4) New projects or programs are assigned to Federal agencies for planning, construction, and operation where there is a substantial involvement of navigation since this is the general historical pattern.

(5) Historical patterns are also observed in the case of flood control. If the project involved the provision of storage or local protection works on the main streams, the Federal interests would be responsible for construction, with responsibility for operation and maintenance dependent upon circumstances. In the case of flood plain management and small reservoir developments located in headwater areas to serve flood control purposes, planning, construction, and operation are designated as non-Federal, although local groups may call upon Federal agencies for assistance in planning.

(6) In the application of the criteria, the incidence of benefits is considered in determining appropriate responsibility. Where benefits are of national significance, Federal responsibility is indicated; where they are local, non-Federal responsibility is indicated. Where these benefits are of regional significance, the matter is decided on a case-by-case basis, considering all of the related circumstances.

(7) In the designation of non-Federal and Federal interest for the major responsibility, there is no intention that such selection would ignore the other interests that may be concerned in planning the details of the proposed program or project. This applies also to construction and operation.

The designation of Federal agencies to have major responsibility for projects and programs generally was made on the basis of the agency usually associated with the purpose having the largest portion of the total allocated costs.

The non-Federal or Federal interests with the major responsibility for accomplishment, including coordinating the preauthorization planning, obtaining final approval or authorization of specific works or facilities, budgeting for appropriations or other funding, design of structures, administration of construction or installation, and other matters pertinent to planning and construction are indicated in Table 4.16. The designation of Federal or non-Federal is not intended to prejudice joint non-Federal and Federal development.

Designation of a Federal agency as having the major responsibility for the Federal aspects of each project, regardless of the magnitude of these Federal aspects, is not intended to reflect any lack of interest by other Federal agencies in a project; in fact, most of the Federal land and water agencies have some interest in each of the projects.

In the general programs, not shown in Table 4.16, the division between non-Federal and Federal principal responsibility is made on the basis of ownership of the land or area involved. For example, wildlife or soil conservation programs on non-Federal lands are the principal responsibility of non-Federal entities; forestry programs on a military reservation or national forest are a principal Federal responsibility; and recreation programs on a Federal multiple-purpose reservoir project, which envisions Federal acquisition of the general reservoir area, are a principal Federal responsibility.

Early Action Phase

Action to achieve the comprehensive plan for the 1960-2000 period must be continued throughout the period to develop the basin resources in an orderly manner and to help stimulate growth in the basin economic structure. In order to meet immediate requirements, certain of the projects and programs contained in the comprehensive plan for the basin should be initiated as quickly as detailed plans can be prepared for them and necessary financing and other arrangements can be made. These more urgent projects and programs have been included in the action phase of the program to be accomplished or in the process of accomplishment, by 1975. The action phase covers the period from 1960 to 1975, so part of the plan has been accomplished prior to the completion of this Report. Other parts of the plan that should be underway, however,

TABLE 4.16

Responsibility for Implementing Projects

Major responsibility for implementing designated projects		Projects	Early action phase[1]	Purpose[1]	Federal agency with major responsibility for Federal aspects
--	Federal	Shiloh	--	FC, PA, I, R, F&W	Corps of Engineers
Non-Federal	--	Franks Creek	E	F&W, R	Bureau of Outdoor Recreation, National Park Service[2]
Non-Federal	--	Tifton	E	PA, R, I, FC, F&W	Bureau of Outdoor Recreation, National Park Service[2]
--	Federal	Hixtown Marsh	E	F&W, R, I	Bureau of Sport Fisheries and Wildlife
Non-Federal	--	Moultrie	E	R, F&W, FC, PA, I	Bureau of Outdoor Recreation, National Park Service[2]
Non-Federal	--	Mud Swamp	E	R, F&W, I	Bureau of Sport Fisheries and Wildlife
Non-Federal	--	Quitman	E	FC, R, I, F&W, PA	Bureau of Outdoor Recreation, National Park Service[2]
Non-Federal	--	Nashville	--	R, F&W, FC, PA, I	Bureau of Outdoor Recreation, National Park Service[2]
Non-Federal	--	Ashburn	--	PA, R, F&W, FC, I	Public Health Service
Non-Federal	--	Alapaha	--	PA, R, F&W, FC, I	Bureau of Outdoor Recreation, National Park Service[2]

NOTES: [1] E —Early action phase development
FC —Flood control
N —Navigation
I —Irrigation
F&W—Fish and wildlife
R —Recreation
PA —Pollution abatement
[2] Designated agency depends on the established division of responsibility between the Bureau of Outdoor Recreation and National Park Service.

involve physical and institutional problems that are causing delays. If the proposed 15-year program is to be completed by 1975, prompt and concerted action must be taken to get more development work underway and to arrange for its financing. If the program is delayed, there will be a related delay in the area economic activities and the established goals will not be reached until some time after 1975. If a balanced accelerated development program is carried out, some delay would not seriously affect the benefits expected.

While most of the projects and programs included in the plan involve some degree of Federal and State participation, they are, almost without exception, the types of development that must be initiated at the local level. One of the first and important steps needed to insure the success of a needed development is to inform the local public about the type of development being considered, the need for that development, and the results that it will provide in terms of benefits and costs. When the local consensus is that the development should be undertaken, the responsible agency or group, as suggested in the preceding discussion, can be urged to make the necessary plans. With the assistance of active local support, the agency or group carrying primary responsibility for the physical development can move expeditiously and with confidence. Local service organizations or other public membership groups seldom supervise the actual planning, construction, or operation of resource development works, but they generally provide the motivating force that gets them started. They can also contribute greatly in solving cost sharing, financing, and other problems that must be solved before construction can be undertaken.

In the Suwannee basin, many programs for conserving, developing, and utilizing land and water resources have been in operation for some time. Their continuation, expansion, and improvement form an important part of the com-

prehensive plan. Action for implementing new or expanded aspects of these programs will be needed throughout the life of the plan and will generally increase gradually in proportion to population and economic growth. However, there are certain components of these programs on which action should be started early. Included in this category are improvement works having a long timelag between initial action and full utilization, activities for conserving and protecting resources for future use, and items that require special emphasis or action to bring them in balance with general development.

Increments of the water supply program for domestic, municipal, and industrial uses should be installed to keep current with the needs of the population. Unless this is done, detrimental shortages and possibile competition between users could occur, and economic growth would be hampered. It is estimated that about 57 percent of the total investment costs for the water supply program would be expended by 1975.

Immediate action should be taken to develop a long-range plan for the adequate handling of the liquid wastes. Such wastes must ultimately be discharged into the water courses, and volume will increase in direct proportion to growth and development. Unless long-range pollution abatement plans are followed, water resources will be damaged and beneficial uses impaired. It is estimated that about 60 percent of the total investment costs for treatment facilities would be required in the early action phase. In addition, streamflow regulation should be initiated as a complementary measure in the water quality control program.

The public health programs of vector control, solid-waste collection and disposal, and air pollution and radiation monitoring should also be initiated to protect and maintain the healthful environment of the basin for the benefit of its residents, and to enhance the attraction of the basin for industry, tourists, and recreationists. It is expected that these programs would be initiated and carried out on an annual operation and maintenance basis.

Land should be acquired for 16 major and 99 minor water-access areas and facilities installed to accommodate about 520,000 user-days annually for recreation and about 198,000 user-days annually for fishing to meet the anticipated 1960-75 needs of the population and tourists.

Upstream watershed projects should be started in the early action phase to alleviate existing problems and provide watershed protection, flood prevention, drainage, recreation, fishing, and water resources development for the improvement of agricultural lands and other areas.

The installation of irrigation and drainage programs will depend to a great extent on the desires and needs of individuals and small groups to replace marginal units, improve farm efficiency, and improve land use, as alternatives to other improved management practices. Many new systems will be installed before 1975.

While the utilization of soil resources will be largely controlled by year-to-year requirements, all reasonable effort should be expended to apply adequate soil conservation practices as quickly as possible on all land not now protected. Permanent conservation measures remaining to be applied should be installed in the early action phase to the maximum extent possible.

To protect and conserve forests for future use, the major parts of tree planting and fire-, insect-, and disease-control facilities should be installed before 1975. To facilitate the present and future operation of the forestry program, forestry education and research should be given early emphasis, and drainage and road facilities should be installed.

The improvement of existing wildlife facilities, extensive development, and supporting programs of research, education, and enforcement activities should be initiated in the early action phase. Likewise for sport fishing, improvement of existing facilities on the rivers and small and large impoundments, new facilities on salt water, and supporting activities should be initiated.

The commercial fisheries program should be initiated and all investment costs expended in the early action phase to restore this basic local industry.

Some features of the recreation program will require action ahead of that required for gradual development to meet current needs. These are the designation of recreational areas for future use, the acquisition of needed lands, and the installation of basic facilities required for future expansion.

The navigation channel from East Pass through West Gap should be constructed when the Gulf Park recreation development begins.

Seven reservoir projects are included in the early action phase, and these involve some expenditures for facilities and operation, maintenance, and replacements that will not be made until after 1975. Similarly, some of the benefits from the works to be constructed before 1975 will not accrue until after that date. Both the delayed costs and delayed benefits have been appropriately discounted and are reflected in the annual equivalents used in economic studies.

Three of the water control projects included in the comprehensive program—the Ashburn, Nashville, and Alapaha reservoirs—will not be needed until some time after 1975 and so are not included in the action phase. Shiloh reservoir will be needed by 1975, but it involves physical considerations that will require time-consuming studies and that may alter the plans somewhat, so it was considered impractical to assume that the project could be completed before 1975.

The early action phase expenditures are summarized in Table 4.17.

TABLE 4.17
Early Action Phase
(thousands of dollars)

Project or program	Investment to 1975
Franks Creek	4,208
Tifton	4,570
Hixtown Marsh	1,255
Moultrie	2,712
Mud Swamp	525
Quitman	14,640
Water-access areas	6,300
Upstream watersheds	3,410
Water supplies	12,850
Navigation channel	70
Irrigation and drainage	4,462
Soil conservation	9,431
Forest conservation	45,820
Fish and wildlife	148
Recreation	12,620
Pollution abatement and public health	24,490

SECTION V – PROJECTS AND PROGRAMS

The coordinated comprehensive plan for the Suwannee basin includes land and water resource developments that contribute to meeting the needs projected to the year 2000. Resource developments existing and under construction as of 1960 are a necessary part of the plan to meet the needs. However, only proposals for new developments and for expansion of existing developments to be made during the period 1960-2000 are presented and evaluated here.

Some features of single-purpose projects and programs are discussed under Plan by Purpose in Section II of this Part. Only the pertinent parts of multiple-purpose developments are covered in the Plan-by-Purpose summaries. In order to bring all of the data for multiple-purpose developments together, each of facilities is described in the pages that follow, and summaries for the entire project are provided. A more detailed summary of the existing and proposed single-purpose facilities and a summary of rural zoning needs are also included to provide additional background for the comprehensive plan. An analysis by States and the early action phase of development are shown for each project and program. The items are listed in the same order as they appear in Table 4.1.

All elevations shown are related to mean sea level. Spillway discharges shown were estimated for a reservoir water surface at maximum pool elevation. Minimum flows listed for streams below dams are those that can be made available at least 90 percent of the time during any 10 consecutive years.

FRANKS CREEK PROJECT

Location

Franks Creek reservoir would be located on Franks Creek, a tributary of Little River, which is a tributary of Withlacoochee River. The damsite is about 7 miles northwest of the Valdosta

FRANKS CREEK PROJECT

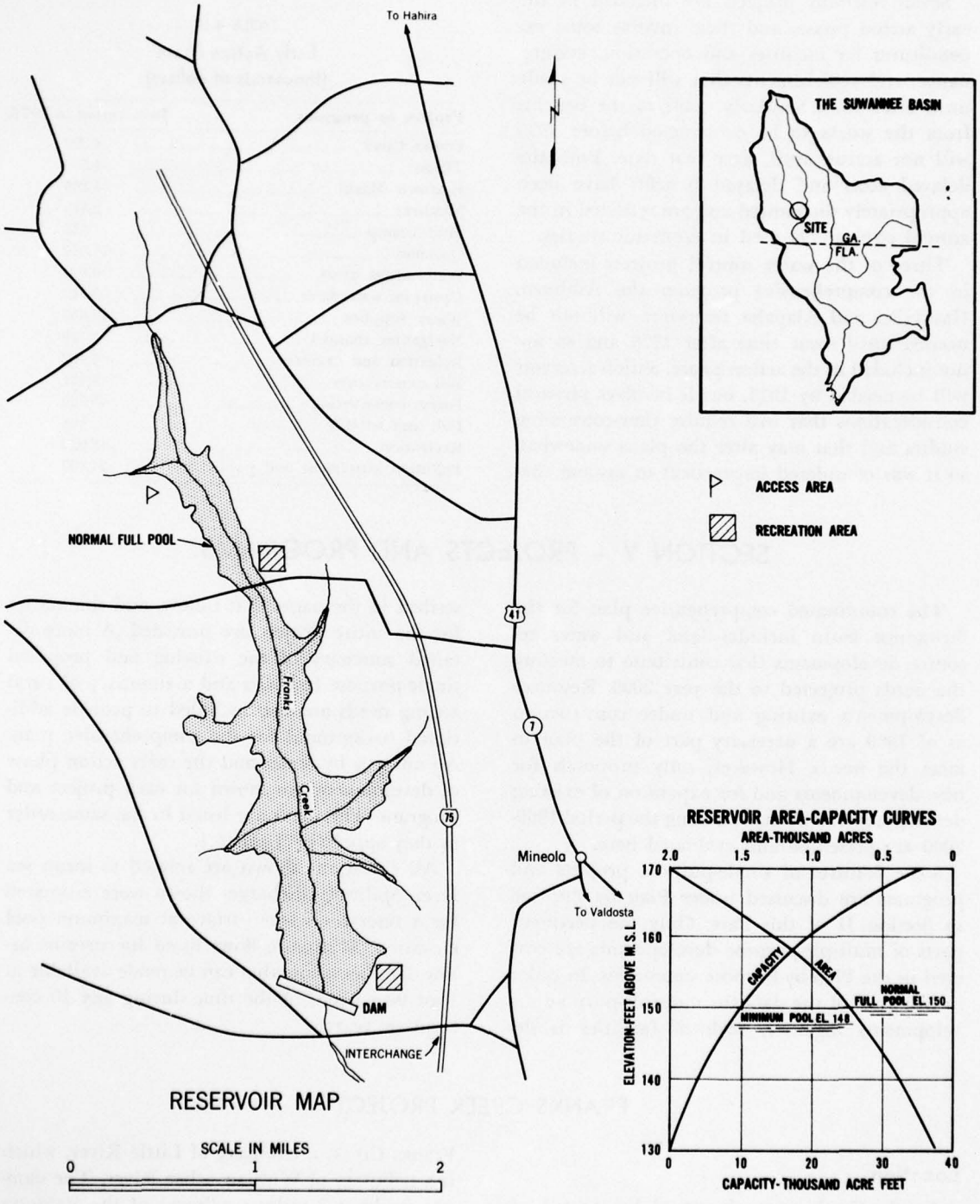


Figure 4.11

business district, and the reservoir would lie west of and adjacent to U. S. Interstate Highway No. 75, in Lowndes County, Georgia.

Plan

The reservoir would be impounded by an earthfill dam with an uncontrolled spillway. The reservoir is designed for recreational use, and all types of recreational facilities would be provided as needed to serve 500,000 user-days annually by the year 2000. About 6,100 user-days per year of fishing use are anticipated. General geologic information indicates no critical foundation conditions at the damsite. The reservoir overlies what may be a subterranean fault. The reservoir would be operated at a level that would not interfere with maintenance or use of the interstate highway. The reservoir water surface could be fluctuated frequently to help control vectors.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	30
Dam		
Top elevation	ft.	161
Maximum height	ft.	40
Length	ft.	2,500
Spillway		
Crest elevation	ft.	150
Effective length	ft.	330
Design discharge	c.f.s.	19,000
Reservoir		
Area — Normal full pool	acre	800
— Maximum pool	acre	1,100
— Minimum pool	acre	700
Capacity — Normal full pool	acre-ft.	10,000
— Maximum pool	acre-ft.	15,000
— Minimum pool	acre-ft.	8,000
Elevation — Normal full pool	ft.	150
— Maximum pool	ft.	156
— Minimum pool	ft.	148
Minimum flow provided in stream below dam	c.f.s.	0

Benefits

Annual Equivalent Primary Tangible ($1,000)

Recreation	1,009
Fish and wildlife	7
Total	1,016

Impacts

Franks Creek reservoir would be designed as a service facility for tourists on Interstate No. 75, as well as for regional and local use. It would serve as a sort of "welcome station" where travelers could be acquainted with the opportunities that the Suwannee basin has to offer, so its impact would reach beyond the local area. For that reason it is recommended as a regional reservoir and as a demonstration in recreational use of such facilities.

The facilities covered by the cost and benefit analyses are only those needed for optimum day use, but the site could, with careful zoning and management, be used for overnight tourist accommodations, a children's amusement park, or other features that would help make the traveler's stay a pleasant one. It is also possible that certain areas, particularly those on the west shore of the lake, could be reserved for homesite development, under leasing or easement arrangements that would provide proper control of the use of such sites.

Since a sizable portion of the project would be paid for by local interests, secondary benefits from the Franks Creek development stemming from increased sales of recreation and fishing equipment, gasoline, food, beverages, and lodging are of particular interest locally. The increased sales would result in increased business and employment in the services and trades. In addition, a large part of the construction cost would be spent in the local area for wages, materials, and services.

Costs ($1,000)

	Early action	Total
Investment		
Franks Creek dam and reservoir	1,840	1,840
Recreation facilities	2,353	2,615
Fish and wildlife facilities	15	15
Total	4,208	4,470
Annual Equivalent		
Investment		158
Operation, maintenance, and replacements		161
Total		319

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	4,410	316	160	172
Fish and wildlife	60	3	1	1
Total	4,470	319	161	173

Special Considerations

There are no records of flow for Franks Creek. The plans presented here are based on stream-flows estimated by drainage-area proportions of measured flows at downstream points. A gaging station should be installed on Franks Creek at the earliest possible date. After Shiloh reservoir is built, water could be pumped from Shiloh to Franks Creek reservoir at comparatively low cost, should that be found desirable. The Franks Creek site should be acquired as soon as practicable. Development at the site should be planned to complement that provided at Mud Swamp, and the two projects might appropriately be operated and maintained jointly.

TIFTON PROJECT

Location

Tifton damsite is on Little River about 5 miles northwest of Tifton, in Tift County, Georgia. The reservoir would extend into Worth and Turner Counties.

Plan

The proposed project consists of a dam and reservoir, a park, and a water-access area. Benefits would be realized from pollution abatement, recreation, fish and wildlife, irrigation, and flood control.

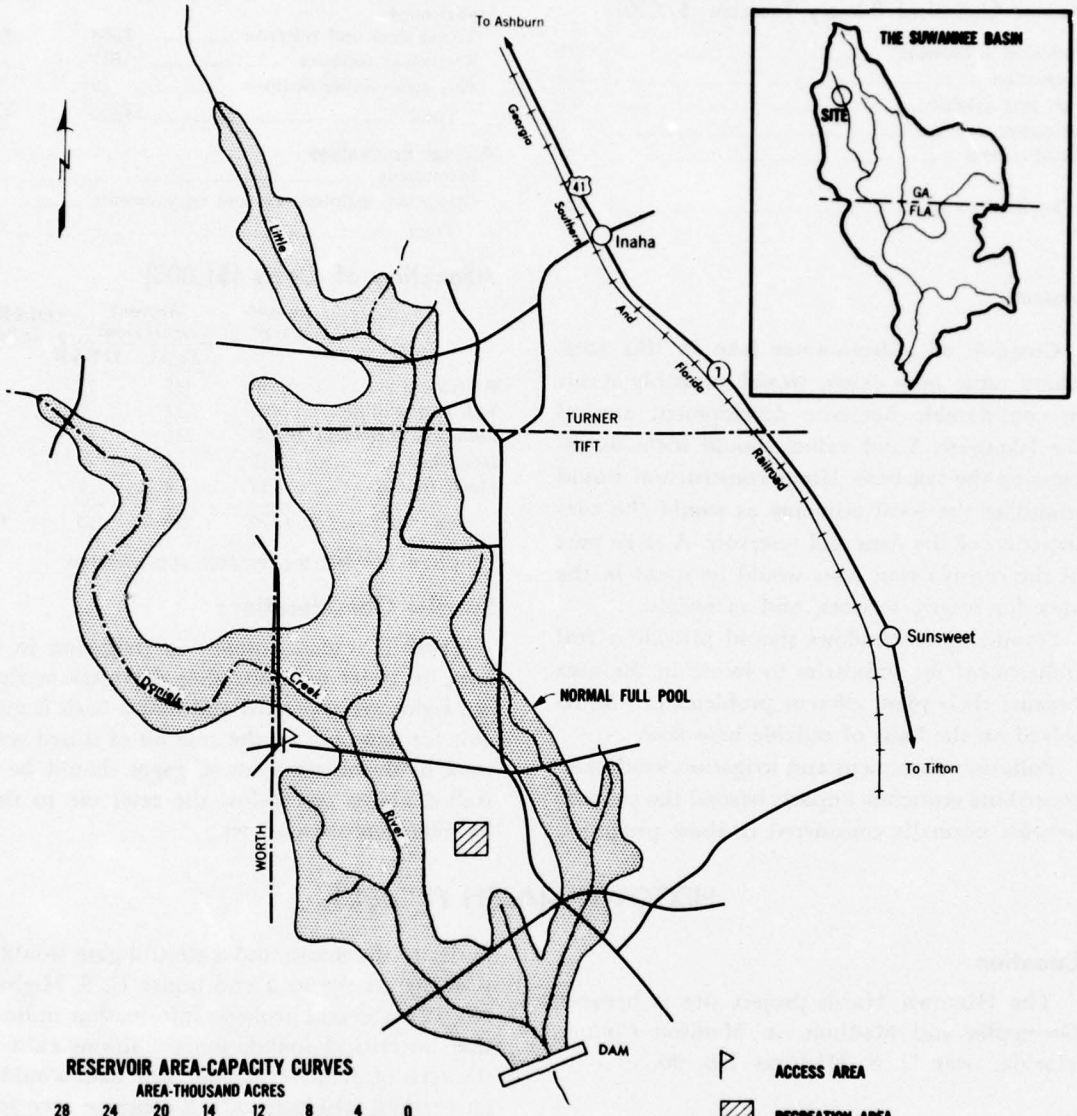
The dam would be an earthfill structure with a gated concrete spillway section and an apron located in the middle of the dam. General geologic information indicates that no critical foundation conditions exist at the damsite.

The reservoir area would be cleared to normal full pool elevation. Land for the reservoir would be acquired to the spillway design pool elevation and would total 4,200 acres. In addition, about 2,000 acres would be acquired for parks, access areas, and other public use, mostly on an island within the reservoir area. The principal relocations would be about 4 miles of secondary roads, 3 ½ miles of power and telephone lines, and several farm homes. About ½ mile of county road would need to be raised and improved to provide access to the island. Recreation facilities to be provided would be for boating, swimming, camping, picnicking, and sightseeing. These facilities would handle 175,000 user-days annually. In addition to the recreation area, an access point for fishermen would be provided adjacent to the reservoir. The reservoir would sustain 6,200 user-days of fishing annually. Storage of water for the irrigation of about 300 acres of land by the year 2000 would be provided. The reservoir would be operated to maintain a live stream below the dam and to minimize mosquito and other public health problems.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	110
Dam		
Top elevation	ft.	303
Maximum height	ft.	28
Length	ft.	4,200
Spillway		
Crest elevation	ft.	288
Effective length	ft.	600
Design discharge	c.f.s.	30,000
Reservoir		
Area — Normal full pool	acre	3,400
— Maximum pool	acre	4,200
— Minimum pool	acre	1,800
Capacity — Normal full pool	acre-ft.	27,000
— Maximum pool	acre-ft.	42,000
— Minimum pool	acre-ft.	10,000
Elevation — Normal full pool	ft.	295
— Maximum pool	ft.	298
— Minimum pool	ft.	288
Minimum flow provided in stream below dam	c.f.s.	40

TIFTON PROJECT



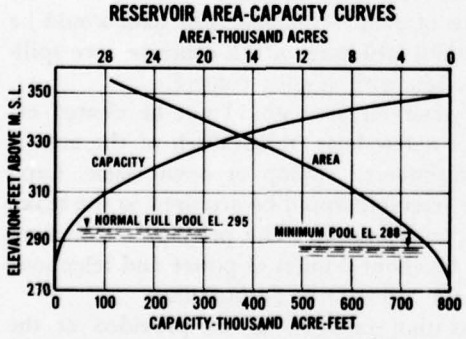


Figure 4.12

Benefits

Annual Equivalent Primary Tangible ($1,000)

Pollution abatement	124
Recreation	273
Fish and wildlife	24
Irrigation	1
Flood control	2
Total	424

Impacts

Creation of a fresh-water lake in this area, where none now exists, would probably result in considerable homesite development around the lakeshore. Land values should increase, increasing the tax base. Home construction would stimulate the local economy as would the construction of the dam and reservoir. A large part of the construction costs would be spent in the area for wages, services, and materials.

Stabilizing streamflows should provide a real inducement for industries to locate in the area because their plant effluent problems can be resolved on the basis of reliable base flow.

Pollution abatement and irrigation would also contribute economic impacts beyond the primary benefits normally considered in these programs.

Costs ($1,000)

	Early action	Total
Investment		
Tifton dam and reservoir	3,638	3,638
Recreation facilities	917	917
Fish and wildlife facilities	15	15
Total	4,570	4,570
Annual Equivalent		
Investment		165
Operation, maintenance, and replacements		125
Total		290

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	2,040	148	74	76
Fish and wildlife	430	24	9	9
Pollution abatement	*2,050	115	41	41
Irrigation	17	1	...	...
Flood control	33	2	1	1
Total	4,570	290	125	127

* Includes $408,000 for low-flow augmentation.

Special Considerations

There is intense interest in irrigation in the area. In order to insure that downstream riparian rights are protected and that a basis is available for determining the amount of stored water used in downstream areas, gages should be installed above and below the reservoir to show its effect on streamflows.

HIXTOWN MARSH PROJECT

Location

The Hixtown Marsh project site is between Greenville and Madison, in Madison County, Florida, near U. S. Highway No. 90.

Plan

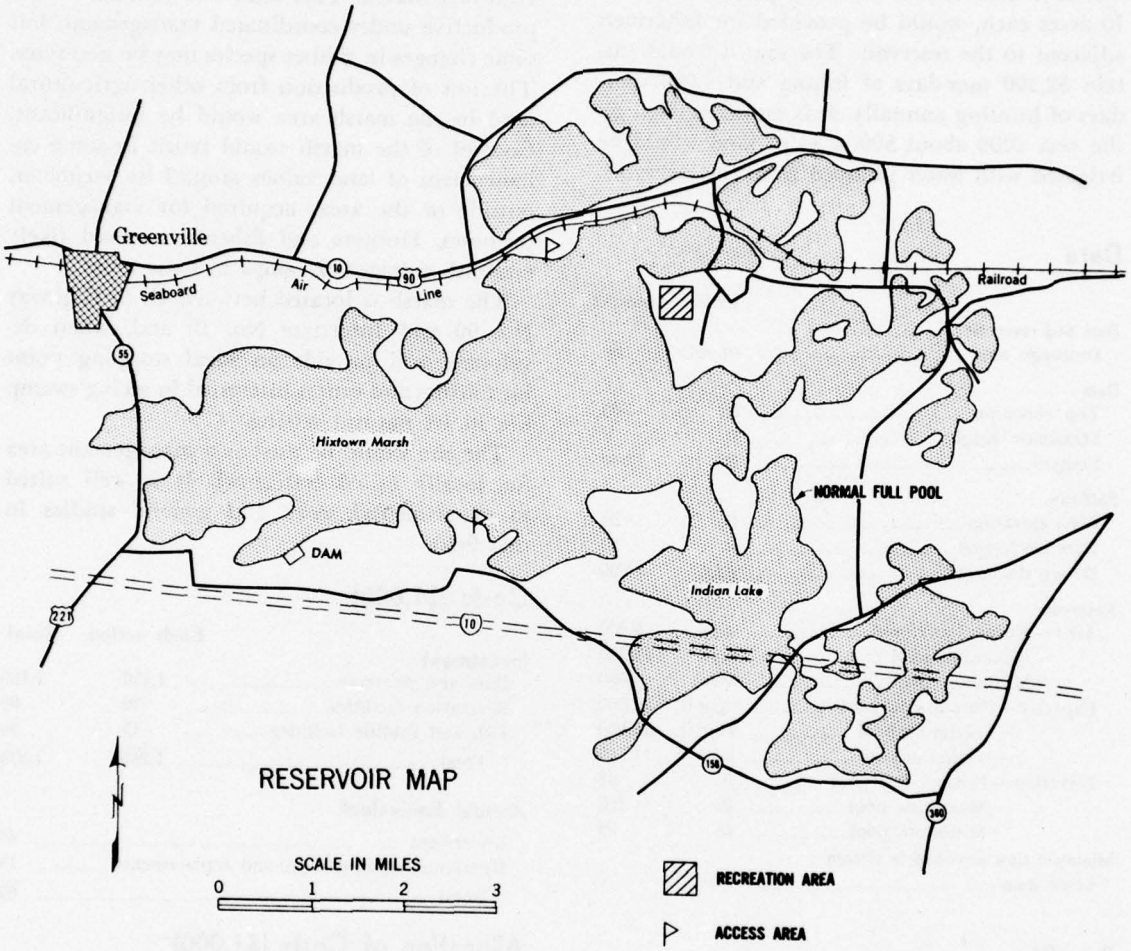
The project consists of a small dam to permit control of water levels in a natural marsh area, two water access areas, and a recreation area. Benefits would be realized from recreation, fish and wildlife, and irrigation. There will be no storage space, as such, in the reservoir, but water levels will be fluctuated when necessary for waterfowl food production, vector control, and other management purposes.

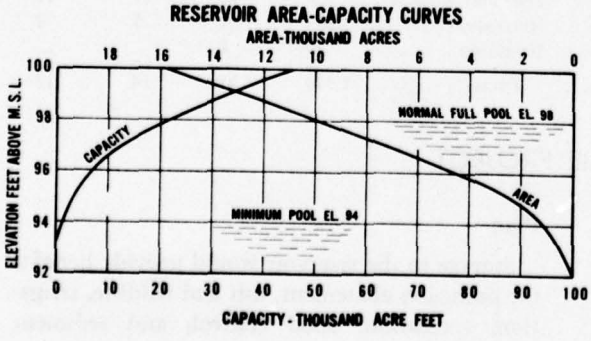
The dam would be constructed at the southern outlet to the marsh and a control gate would be provided at the west end under U. S. Highway No. 221. General geologic information indicates that no critical foundation conditions exist for the type of dam considered. The dam would be an earthfill structure with a concrete ogee spillway section with stoplog control.

The reservoir area would not be cleared except for a few boat trails. Much of the area is now untimbered swamp or open water. Land for the reservoir would be acquired to the maximum pool elevation. The principal relocations would be about 2 miles of power and telephone lines and a few farm outbuildings.

Recreation facilities to be provided at the park would be for boating, camping, picnicking, and sightseeing. These facilities would initially

HIXTOWN MARSH PROJECT





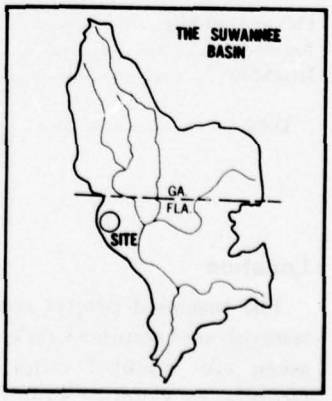


Figure 4.13

handle 15,000 recreation user-days annually, and the maximum development would be for 20,000 user-days annually. Two access points, of about 10 acres each, would be provided for fishermen adjacent to the reservoir. The marsh would sustain 32,300 user-days of fishing and 3,000 user-days of hunting annually. It is estimated that by the year 2000 about 500 acres of land would be irrigated with water pumped from the reservoir.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	60
Dam		
Top elevation	ft.	105
Maximum height	ft.	8
Length	ft.	1,000
Spillway		
Crest elevation	ft.	94
Effective length	ft.	30
Design discharge	c.f.s.	1,000
Reservoir		
Area — Normal full pool	acre	9,900
— Maximum pool	acre	15,700
— Minimum pool	acre	1,000
Capacity — Normal full pool	acre-ft.	22,000
— Maximum pool	acre-ft.	45,000
— Minimum pool	acre-ft.	1,500
Elevation — Normal full pool	ft.	98
— Maximum pool	ft.	100
— Minimum pool	ft.	94
Minimum flow provided in stream below dam	c.f.s	0

Benefits

Annual Equivalent Primary Tangible ($1,000)

Fish and wildlife	44
Recreation	23
Irrigation	1
Total	68

Impacts

There are about 5,000 acres of forest land in Hixtown Marsh. This land can continue to be productive under coordinated management, but some changes in timber species may be necessary. The loss of production from other agricultural land in the marsh area would be insignificant. Control of the marsh would result in some enhancement of land values around its perimeter, outside of the areas acquired for management purposes. Hunters and fishermen would likely establish cottages or camps in some areas.

The marsh is located between U. S. Highway No. 90 and Interstate No. 10 and, when developed, will provide an ideal stopping point for tourists and others interested in seeing swamp life in its natural setting.

The site would be used as a management area for locally raised waterfowl. It is well suited to experimental work and general studies in this field.

Costs ($1,000)

	Early action	Total
Investment		
Dam and reservoir	1,150	1,150
Recreation facilities	90	90
Fish and wildlife facilities	15	30
Total	1,255	1,270

Annual Equivalent

Investment	47
Operation, maintenance, and replacements	18
Total	65

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Fish and wildlife	905	43	11	11
Recreation	345	21	7	7
Irrigation	20	1	—	—
Total	1,270	65	18	18

MOULTRIE PROJECT

Location

The proposed project consists of a dam and reservoir on Okapilco Creek, a park, and a water-access area about 3 miles north of Moultrie, Georgia, in Colquitt County.

Plan

Storage in the reservoir would provide benefits for pollution abatement, fish and wildlife, irrigation, recreation, flood control, and sediment control.

MOULTRIE PROJECT

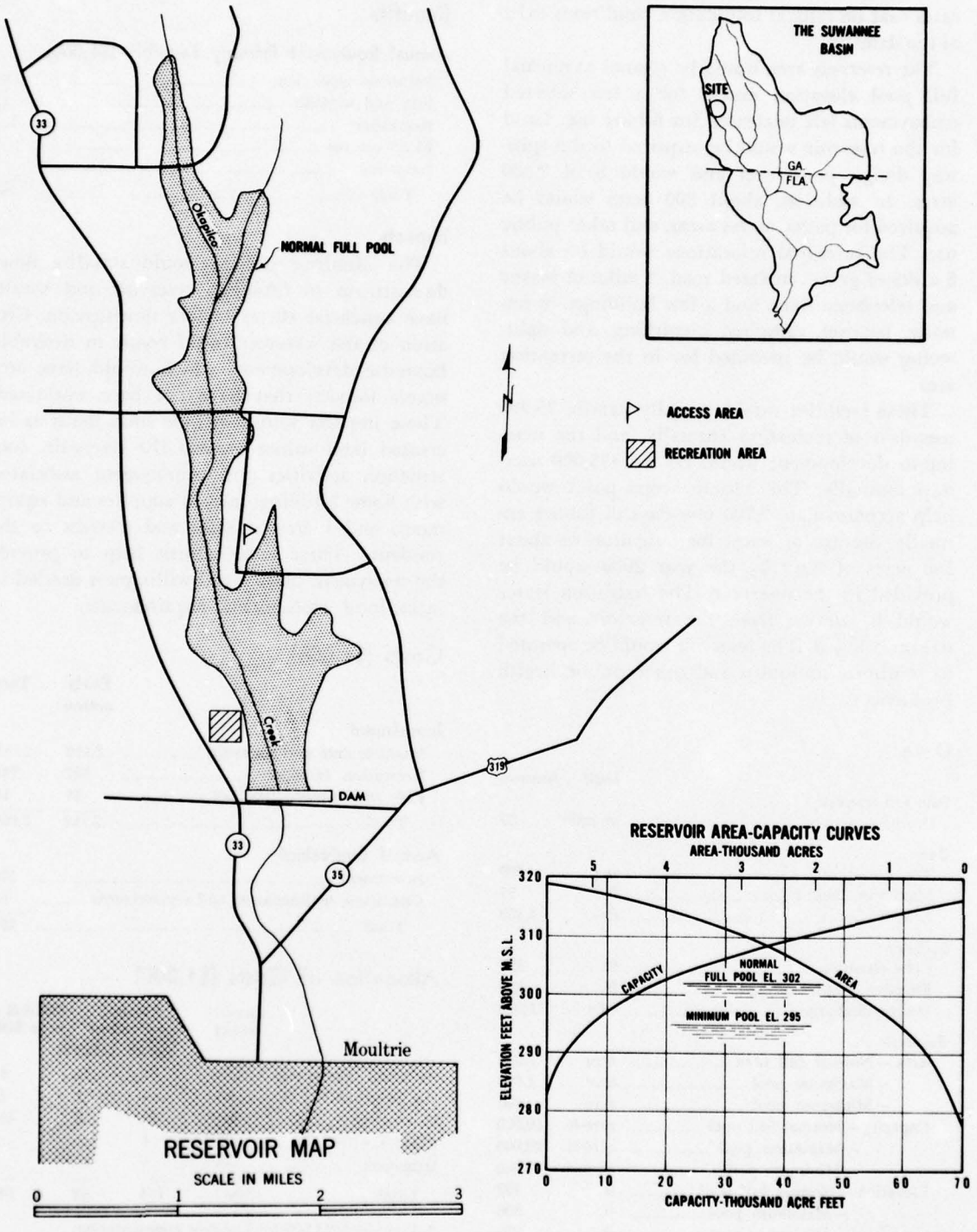


Figure 4.14

The dam would be an earthfill structure with a gated concrete spillway section in the middle of the dam. General geologic information indicates that no critical foundation conditions exist at the damsite.

The reservoir area would be cleared to normal full pool elevation except for a few selected embayments left uncleared for fishing use. Land for the reservoir would be acquired to the spillway design pool level and would total 2,300 acres. In addition, about 200 acres would be acquired for parks, access areas, and other public use. The principal relocations would be about 3 miles of gravel surfaced road, 3 miles of power and telephone lines, and a few buildings. Swimming, boating, camping, picnicking, and sightseeing would be provided for in the recreation area.

These facilities would initially handle 75,000 user-days of recreation annually, and the maximum development would be for 135,000 user-days annually. The 10-acre access point would help accommodate 9,700 user-days of fishing annually. Storage of water for irrigation of about 500 acres of land by the year 2000 would be provided in the reservoir. The irrigation water would be drawn from the reservoir and the stream below it. The reservoir would be operated to minimize mosquito and other public health problems.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	29
Dam		
Top elevation	ft.	309
Maximum height	ft.	34
Length	ft.	4,500
Spillway		
Crest elevation	ft.	295
Effective length	ft.	150
Design discharge	c.f.s.	15,000
Reservoir		
Area – Normal full pool	acre	1,650
– Maximum pool	acre	2,300
– Minimum pool	acre	900
Capacity – Normal full pool	acre-ft.	19,000
– Maximum pool	acre-ft.	29,000
– Minimum pool	acre-ft.	7,000
Elevation – Normal full pool	ft.	302
– Maximum pool	ft.	306
– Mini.num pool	ft.	295
Minimum flow provided in stream below dam	c.f.s.	20

Benefits

Annual Equivalent Primary Tangible ($1,000)

Pollution abatement	85
Fish and wildlife	12
Recreation	184
Flood control	2
Irrigation	1
Total	284

Impacts

The Moultrie project would stabilize flows downstream to Okapilco reservoir and would have beneficial effects farther downstream. Creation of the reservoir could result in desirable homesite developments which would have economic impacts that have not been evaluated. These impacts would include such items as increased land values around the reservoir, construction activities and employment associated with home building, sales of supplies and equipment, and increased sales and services to the residents. These local returns help to provide the repayment ability and willingness needed to meet local cost-sharing requirements.

Costs ($1,000)

	Early action	Total
Investment		
Moultrie dam and reservoir	2,110	2,111
Recreation facilities	587	734
Fish and wildlife facilities	15	15
Total	2,712	2,860
Annual Equivalent		
Investment		102
Operation, maintenance, and replacements		52
Total		154

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	*1,170	51	9	8
Fish and wildlife	180	8	1	2
Recreation	1,465	93	42	48
Flood control	30	1	—	—
Irrigation	15	1	—	—
Total	2,860	154	52	58

* Includes $218,000 for low-flow augmentation.

Special Considerations

Runoff at the reservoir site is inadequate to provide the 40 cubic feet per second that will ultimately be needed for downstream pollution abatement. Additional dilution water could be obtained by storage on, and diversion from, Warrior Creek northeast of the headwaters of Okapilco Creek. This possibility does not appear to be feasible, but it should be reconsidered when more detailed plans are made.

MUD SWAMP PROJECT

Location

The proposed Mud Swamp development is about 5 miles southwest of Valdosta, Georgia, in Lowndes County.

Plan

The project includes a small dam to control water levels in an existing swamp, a small park and water-access area. It is designed to provide a wading bird habitat and to develop a fishery in an area that has very little economic value under existing conditions. The area would provide excellent habitat for alligators and other water-loving animals and plants. It would provide an attraction to supplement the recreational area planned for Franks Creek reservoir. It is anticipated that the swamp would eventually develop an ecology similar to that in Okefenokee Swamp.

The dam would be a 17-foot high earthfill structure with a stoplog-controlled spillway located at the eastern outlet of the swamp. There would be no major relocations. Land for the reservoir would be acquired to the maximum flood pool elevation. Only a small part of the swamp is in timber. The timbered area would be cleared as necessary to meet State regulations and to provide boat trails. Existing drainage canals in the swamp could be used as boat trails. The swamp would provide 5,700 user-days of fishing in 1975, and 16,200 user-days by 2000. About 200 hunters would use the area annually. Recreation use, in 1975 and 2000, would amount to 15,000 and 20,000 user-days, respectively. Irrigation from the swamp would require no special facilities since farmers adjacent to the area could pump water from the stabilized reservoir to adjacent tilled land. The reservoir would be fluctuated slightly and frequently to control mosquitoes and other health problems.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	22
Dam		
Top elevation	ft.	192
Maximum height	ft.	17
Length	ft.	190
Spillway		
Crest elevation	ft.	175
Effective length	ft.	30
Design discharge	c.f.s.	2,500
Reservoir		
Area — Normal full pool	acre	2,400
— Maximum pool	acre	3,000
— Minimum pool	acre	1,200
Capacity — Normal full pool	acre-ft.	9,000
— Maximum pool	acre-ft.	14,000
— Minimum pool	acre-ft.	1,700
Elevation — Normal full pool	ft.	184
— Maximum pool	ft.	186
— Minimum pool	ft.	180

Benefits

Annual Equivalent Primary Tangible ($1,000)

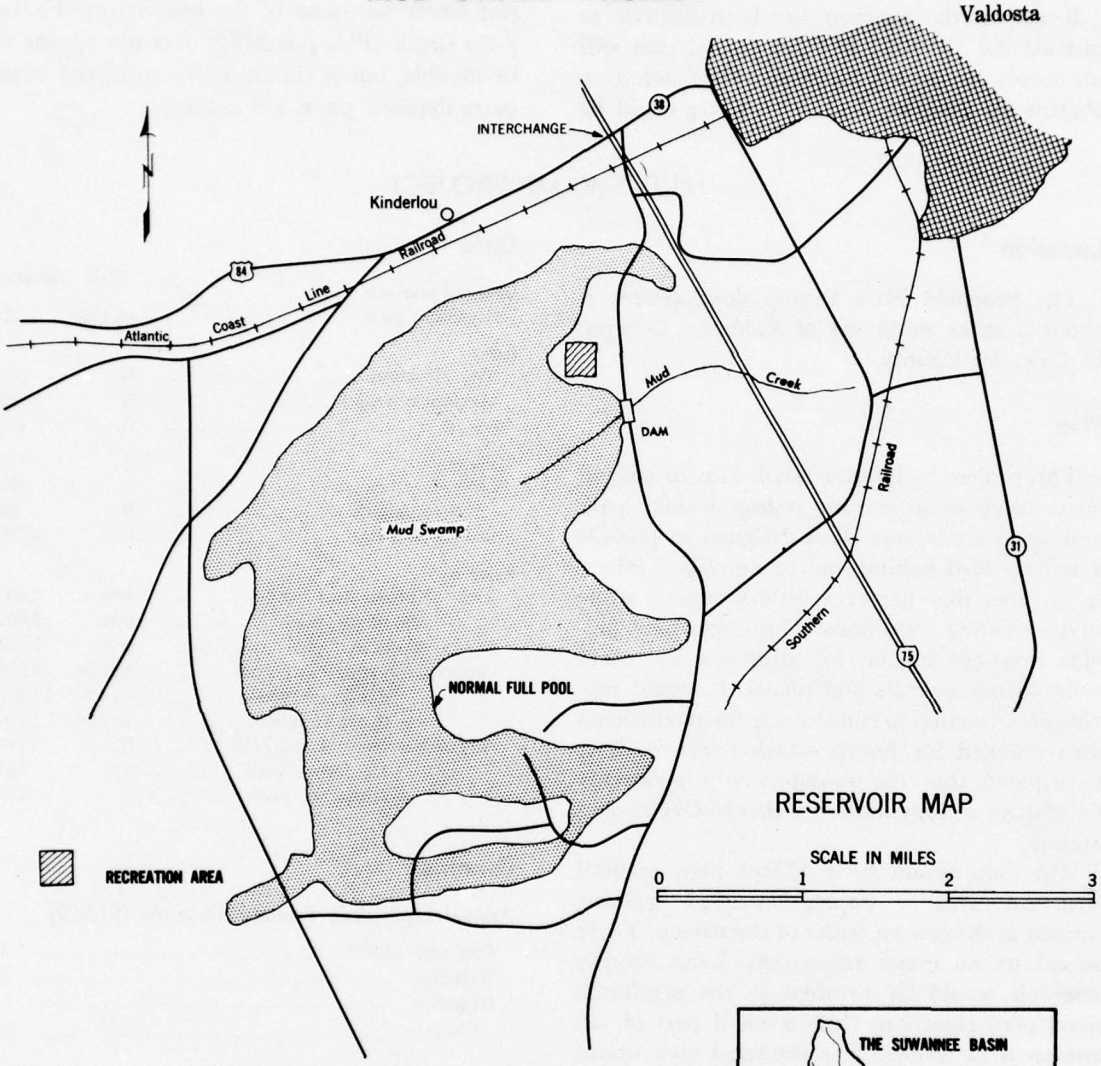
Fish and wildlife	16
Recreation	23
Irrigation	1
Total	40

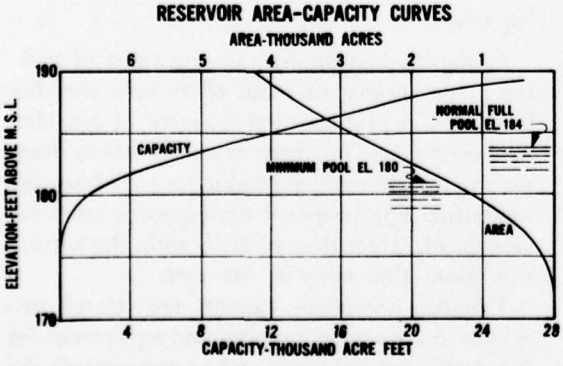
Impacts

Intangible benefits include the value of making a community asset out of an area that has been a local problem and a source of considerable controversy for many years. Efforts to drain the swamp and make it productive have been unsuccessful. The proposed development takes advantage of, rather than conflicts with, the natural conditions that exist in the area.

Tangible secondary benefits are related primarily to the sale of supplies and equipment for fishermen and sightseers and to augmenting the recreational facilities in the Valdosta area. The

MUD SWAMP PROJECT





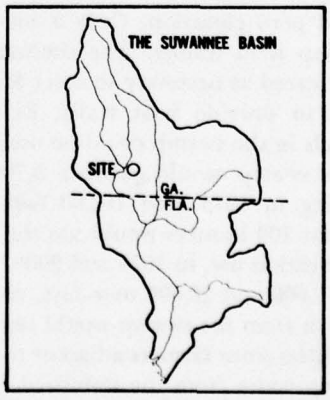


Figure 4.15

attraction lies adjacent to U. S. Interstate Highway No. 75, and should induce tourists to stop in the area and to become better acquainted with the Suwannee basin. To many people, there are important intangible values from seeing wading birds, alligators, and other wildlife in a natural habitat. Operation of this project in conjunction with Franks Creek project would provide a well-rounded recreation program and tourist attraction.

Costs ($1,000)

	Early action	Total
Investment		
Mud Swamp dam and reservoir	420	420
Recreation facilities	90	90
Fish and wildlife facilities	15	15
Total	525	525
Annual Equivalent		
Investment		20
Operation, maintenance and replacements		14
Total		34

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	281	20	9	10
Fish and wildlife	230	13	5	5
Irrigation	14	1	---	---
Total	525	34	14	15

QUITMAN PROJECT

Location

The Okapilco and Quitman dams and reservoirs included in the Quitman project are located on Okapilco Creek about 3 miles north of Quitman, in Brooks County, Georgia.

Plan

The two reservoirs would be operated as a unit and are considered as one project. Preliminary comparative studies showed that it was cheaper to provide the small Quitman reservoir below Okapilco dam to provide for recreation use than to build Okapilco large enough to keep its water surface operating range within desirable limits for all types of recreation. Addition of the Quitman reservoir also has the advantages of getting the major recreation area closer to town, providing better homesites at both reservoirs, and improving the quality of the recreation opportunity provided.

In addition to the two dams and reservoirs, the project would include two parks and four minimum-facility access areas.

General geologic information indicates that no critical foundation conditions exist at the damsites. The dams would be earthfill structures with concrete spillway sections, gated for Okapilco and uncontrolled for Quitman. The Quitman reservoir area would be cleared to normal full pool elevation. About half of Okapilco reservoir would be cleared, leaving bays and other uncleared areas for fishing. Land for the reservoirs would be acquired to the spillway design pool elevation. In addition, about 2,000 acres would be acquired for parks, access, and other public use. The principal relocations would be about 3 miles of surfaced road and 3 miles of power and telephone lines.

Recreation facilities would be for boating, swimming, camping, picnicking, and sightseeing. These facilities would initially handle 200,000 user-days of recreation annually, and the maximum development would be for 500,000 user-days annually. The four access areas would be provided adjacent to the reservoirs. The reservoirs would meet the needs for an additional 21,000 user-days of fishing annually by 1975 and about 60,000 user-days by 2000. Stored water for irrigating about 500 acres of land by the year 2000 would be provided in the reservoirs. The irrigation water would be drawn from the reservoirs or the stream below. The reservoirs would be operated to maintain a minimum downstream flow of 100 cubic feet per second and to minimize mosquito and other public health problems.

QUITMAN PROJECT

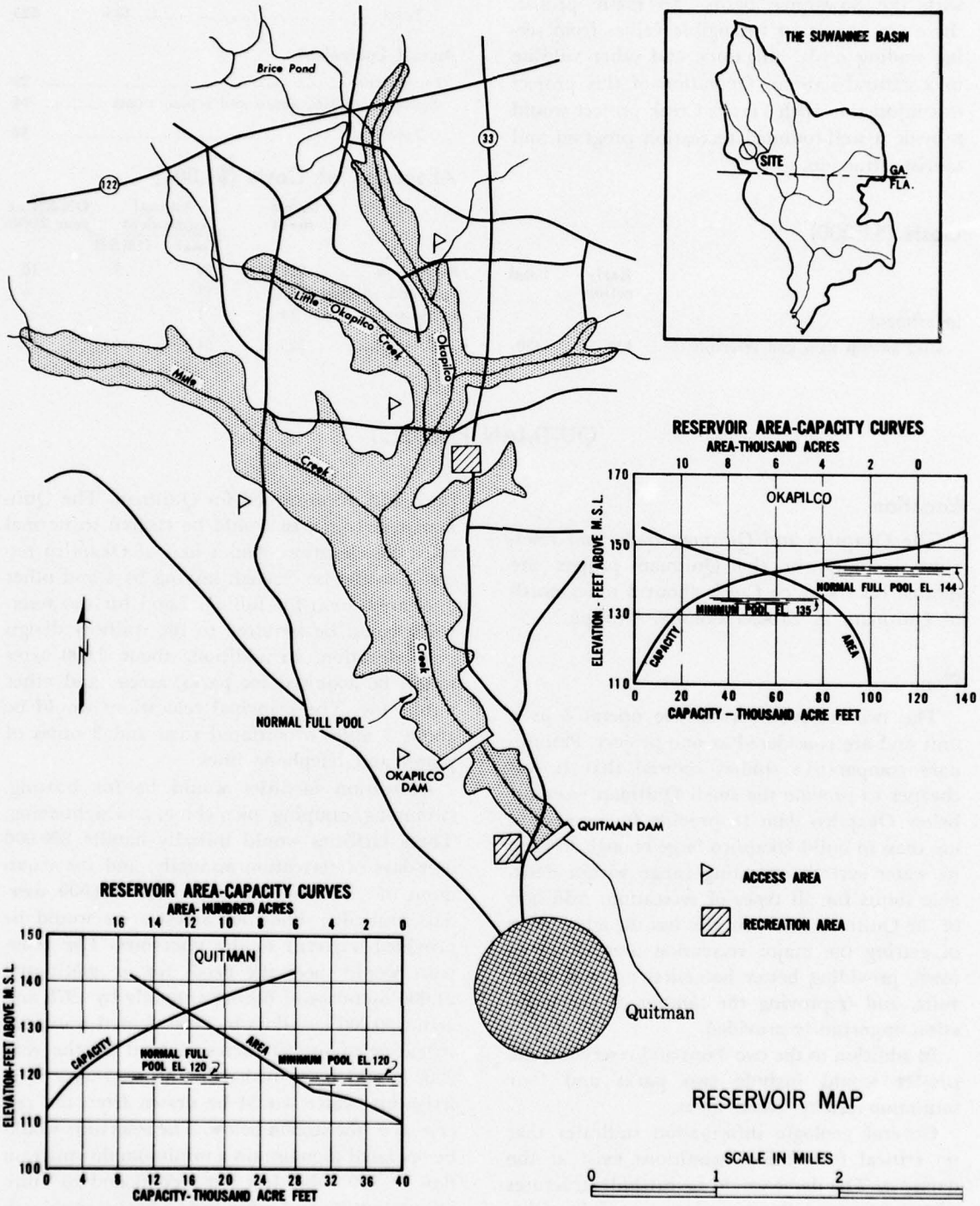


Figure 4.16

Data

	Unit	Amount	
		Okapilco	Quitman
Dam and reservoir			
Drainage area	sq. mile	270	279
Dam			
Top elevation	ft.	155	131
Maximum height	ft.	45	24
Length	ft.	4,300	2,900
Spillway			
Crest elevation	ft.	130	120
Effective length	ft.	300	800
Design discharge	c.f.s.	30,000	32,000
Reservoir			
Area —Normal full pool	acre	7,600	640
— Maximum pool	acre	10,000	900
— Minimum pool	acre	3,800	640
Capacity — Normal full pool	acre-ft.	77,000	3,600
— Maximum pool	acre-ft.	120,000	7,000
— Minimum pool	acre-ft.	26,000	3,600
Elevation — Normal full pool	ft.	144	120
— Maximum pool	ft.	150	126
— Minimum pool	ft.	135	120
Minimum flow provided in stream below dam	c.f.s.	100	100

Benefits

Annual Equivalent Primary Tangible ($1,000)

Pollution abatement	272
Fish and wildlife	72
Recreation	812
Irrigation	1
Flood control	5
Total	1,162

Impacts

These reservoirs are located within easy commuting distance of Quitman, Georgia. It is expected that there will be considerable demand for home and cottage sites around their peripheries. The value of land enhancement is estimated to more than offset losses from lands removed from production.

The construction of the project would provide employment and would result in some influx of workmen and their families. Some temporary overloading of service facilities may result, but additional services established during construction should be advantageous for meeting subsequent expanding needs.

These reservoirs are a part of the water control system for the entire basin and would produce downstream benefits in Georgia and in the lower reaches of Withlacoochee and Suwannee Rivers in Florida.

Costs ($1,000)

	Early action	Total
Investment		
Dams and reservoirs	13,440	13,440
Recreation facilities	1,170	2,400
Fish and wildlife facilities	30	60
Total	14,640	15,900
Annual Equivalent		
Investment		557
Operation, maintenance, and replacements		275
Total		832

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	*4,150	198	49	49
Fish and wildlife	1,080	54	15	15
Recreation	10,570	575	210	240
Flood control	86	4	1	1
Irrigation	14	14	1	—
Total	15,900	832	275	305

* Includes $1,225,000 for low-flow augmentation.

Special Considerations

The monetary advantages of two reservoirs as compared to one are comparatively small. These comparisons, and a study of related impacts, should be carried to more detail before final plans are made.

NASHVILLE PROJECT

Location

Nashville dam and reservoir site is located on the Withlocoochee River near Nashville, Georgia, in Berrien County.

Plan

The project would consist of a dam and reservoir and facilities for recreation and fish and wildlife use at two parks and four access points.

NASHVILLE PROJECT

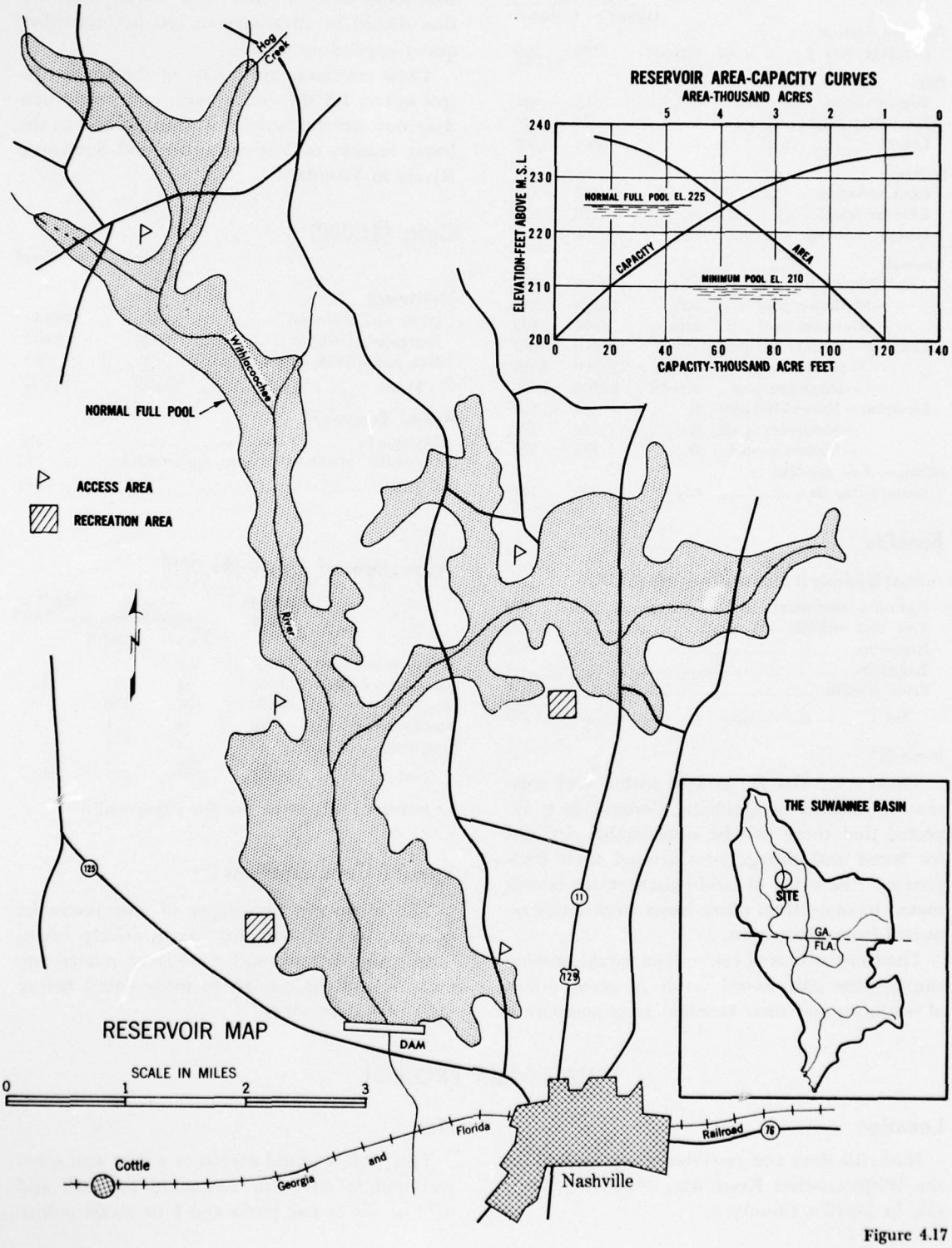


Figure 4.17

The storage would provide benefits for flood control, irrigation, and water quality control, including pollution abatement and low-flow augmentation. The dam would be an earthfill structure with a gated spillway over the stream channel. Some minor road and other relocations would be required. The reservoir would provide 360,000 user-days of recreation and 64,500 user-days of fishing by the year 2000.

The reservoir would be cleared to normal full pool elevation except for some selected bays reserved for fishermen. Land would be acquired to the maximum pool elevation.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	125
Dam		
Top elevation	ft.	238
Maximum height	ft.	48
Length	ft.	4,050
Spillway		
Crest elevation	ft.	205
Effective length	ft.	470
Design discharge	c.f.s.	42,500
Reservoir		
Area — Normal full pool	acre	3,900
— Maximum pool	acre	5,000
— Minimum pool	acre	2,000
Capacity — Normal full pool	acre-ft.	65,000
— Maximum pool	acre-ft.	110,000
— Minimum pool	acre-ft.	20,000
Elevation — Normal full pool	ft.	225
— Maximum pool	ft.	233
— Minimum pool	ft.	210
Minimum flow provided in stream below dam	c.f.s.	29

Benefits

Annual Equivalent Primary Tangible ($1,000)

Pollution abatement	219
Recreation	595
Fish and wildlife	93
Flood control	8
Irrigation	1
Total	916

Impacts

Uncontrolled flows in the upper Withlacoochee are often so low that the stream does not provide a suitable carrier for wastes, even if they are properly treated. Floods are also a problem. Stabilizing the flows and providing an assured minimum flow would permit enhanced use of the stream for industry, fishing, recreation, and other purposes. The reservoir site is located near the city of Nashville, and with proper zoning, parts of the shoreline area could be used for summer and permanent homesite developments. The recreation facilities at the reservoir would probably obviate the need for some recreation development that would otherwise be required at city parks.

Costs ($1,000)

Investment	Early action	Total
Nashville dam and reservoir	0	3,814
Fish and wildlife facilities	0	60
Recreation facilities	0	1,075
Total	0	4,949

Annual Equivalent

Investment	179
Operation, maintenance, and replacements	108
Total	287

Allocation of Costs ($1,000)

	Investment	Annual equivalent Total	Annual equivalent OM&R	OM&R at year 2000
Pollution abatement	*1,230	54	9	9
Fish and wildlife	807	38	9	9
Recreation	2,835	192	90	92
Flood control	69	3	—	—
Irrigation	8	—	—	—
Total	4,949	287	108	110

* Includes $450,000 for low-flow augmentation.

Special Considerations

The reservoir area is near the city of Nashville, so zoning of the area should be considered to avoid problems of providing sewer and other services to areas in the vicinity of the reservoir. The site should be acquired as soon as practicable to prevent its being preempted by other uses.

SHILOH PROJECT

Location

Shiloh reservoir would be located on Little River, a tributary of Withlacoochee River, in Lowndes, Cook, Colquitt, and Brooks Counties, Georgia. The damsite is about 7 miles northwest of the center of the city of Valdosta, Georgia.

Plan

The Shiloh reservoir would provide storage for low-flow augmentation, flood control, and other uses requiring considerable fluctuation in water surface elevations. These fluctuations are somewhat undesirable for recreational use, but limiting the fluctuations reduces the other benefits. It was found that the greatest combined benefits could be realized by adding Franks Creek reservoir to the system to provide for recreational use so that Shiloh could be operated primarily for other purposes.

The Shiloh dam would be an earthfill structure with a gated concrete spillway section located in the middle of the dam. General geologic information indicates that no critical foundation conditions exist at the damsite, but the area borders an artesian aquifer recharge area, and careful geologic studies should be made before construction is undertaken. The reservoir area would be cleared to normal full pool elevation. Land for the reservoir would be acquired to the spillway design pool elevation. Additional land would be acquired for parks, access areas, and other public use. The principal relocations would involve several miles of secondary roads. Recreation facilities would be provided for boating, swimming, camping, picnicking, and sightseeing, and would handle 750,000 user-days annually. Six access points would be provided adjacent to the reservoir to meet the needs for an additional 40,000 user-days of fishing. The reservoir would be operated with fluctuation as necessary to minimize mosquito and other public health problems. Releases would be made when necessary to provide, in conjunction with other reservoirs, a minimum of 1,000 cubic feet per second in the Suwannee River at Ellaville.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	866
Dam		
Top elevation	ft.	160
Maximum height	ft.	55
Length	ft.	6,000
Spillway		
Crest elevation	ft.	130
Effective length	ft.	160
Design discharge	c.f.s.	76,600
Reservoir		
Area — Normal full pool	acre	14,000
— Maximum pool	acre	18,000
— Minimum pool	acre	7,000
Capacity — Normal full pool	acre-ft.	150,000
— Maximum pool	acre-ft.	240,000
— Minimum pool	acre-ft.	60,000
Elevation — Normal full pool	ft.	150
— Maximum pool	ft.	155
— Minimum pool	ft.	140
Minimum flow provided in stream below dam	c.f.s.	200

Benefits

Annual Equivalent Primary Tangible ($1,000)

Pollution abatement	402
Fish and wildlife	117
Recreation	1,501
Flood control	40
Irrigation	2
Total	2,062

Impacts

Valdosta is growing in the direction of the reservoir site, so it is expected that there will be pressure for cottage and homesites around Shiloh and adjacent Franks Creek reservoirs, and that the enhancement in land values will far more than offset the values lost by inundation. These benefits have not been included in the evaluation studies, but they are nonetheless real in terms of raising the area tax base because of the higher values associated with waterfront homes and the value added by summer cottages. A local development agency should be able to recapture an appreciable portion of the land enhancement to assist in paying for the project.

SHILOH PROJECT

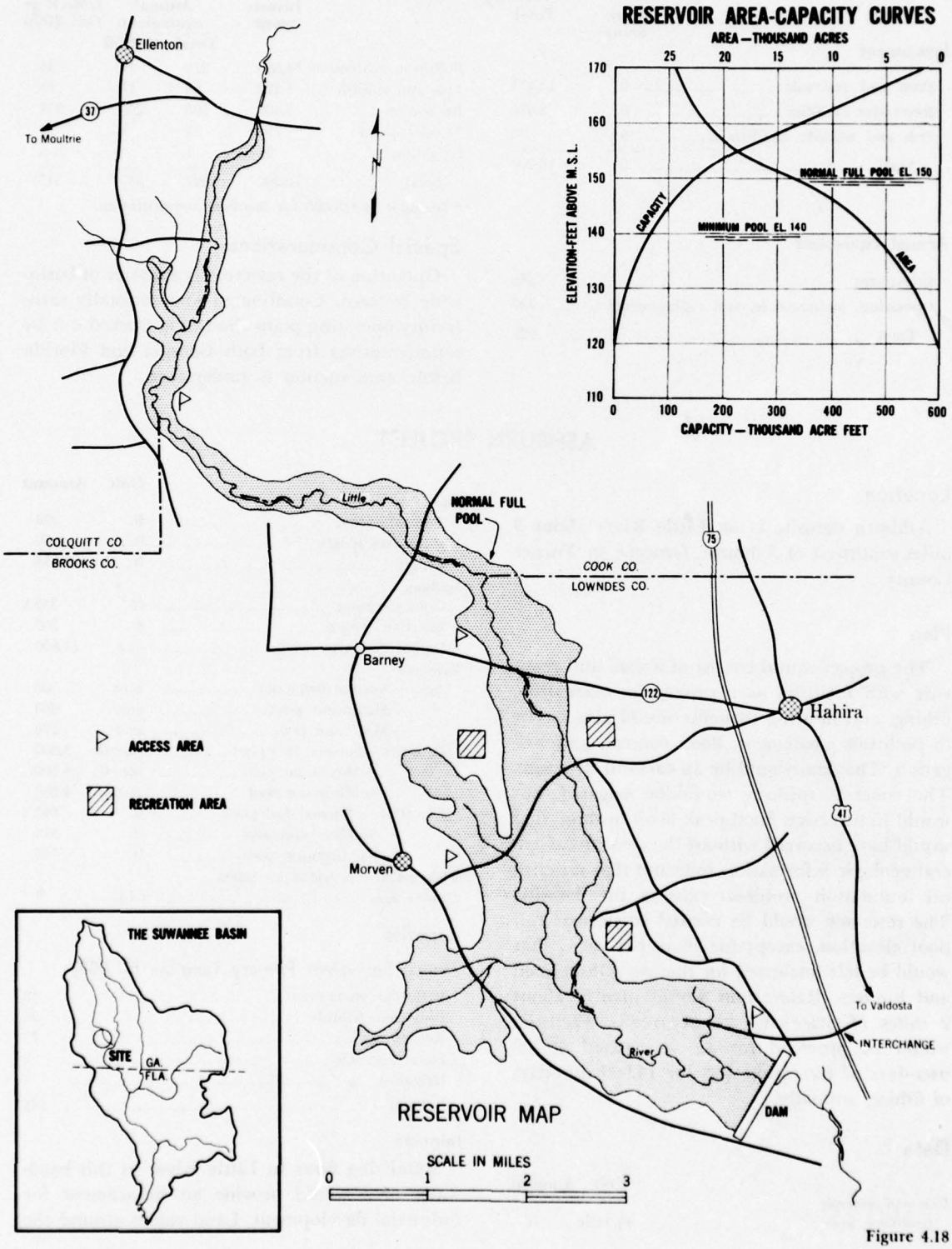


Figure 4.18

Costs ($1,000)

Investment	Early action	Total
Dam and reservoir	0	12,434
Recreation facilities	0	3,676
Fish and wildlife facilities	0	90
Total	0	16,200

Annual Equivalent

Investment	585
Operation, maintenance, and replacements	337
Total	922

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	*4,600	210	44	44
Fish and wildlife	1,420	68	17	18
Recreation	9,400	608	269	274
Flood control	756	35	7	7
Irrigation	24	1		
Total	16,200	922	337	343

* Includes $1,835,000 for low-flow augmentation.

Special Considerations

Operation of the reservoir is a matter of basin-wide concern. Coordinated and mutually satisfactory operating plans should be worked out by representatives from both Georgia and Florida before construction is undertaken.

ASHBURN PROJECT

Location

Ashburn damsite is on Little River about 3 miles southwest of Ashburn, Georgia, in Turner County.

Plan

The project would consist of a dam and reservoir with facilities as necessary for recreation, fishing, and hunting. Benefits would also accrue to pollution abatement, flood control, and irrigation. The dam would be an earthfill structure. The concrete spillway would be ungated, but would limit design flood peak flows to those that would have occurred without the structure. General geologic information indicates that no critical foundation problems exist at the damsite. The reservoir would be cleared to normal full pool elevation, except for some bay areas that would be left uncleared for the use of fishermen and hunters. Relocations would involve about 2 miles of State and county roads. Facilities would be provided for an anticipated 40,000 user-days of recreation and for 14,900 user-days of fishing annually.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	16
Dam		
Top elevation	ft.	360
Maximum height	ft.	30
Length	ft.	1,015
Spillway		
Crest elevation	ft.	346.5
Effective length	ft.	200
Design discharge	c.f.s.	11,800
Reservoir		
Area — Normal full pool	acre	500
— Maximum pool	acre	660
— Minimum pool	acre	270
Capacity — Normal full pool	acre-ft.	3,000
— Maximum pool	acre-ft.	4,600
— Minimum pool	acre-ft.	1,250
Elevation — Normal full pool	ft.	346.5
— Maximum pool	ft.	349
— Minimum pool	ft.	342
Minimum flow provided in stream below dam	c.f.s.	9

Benefits

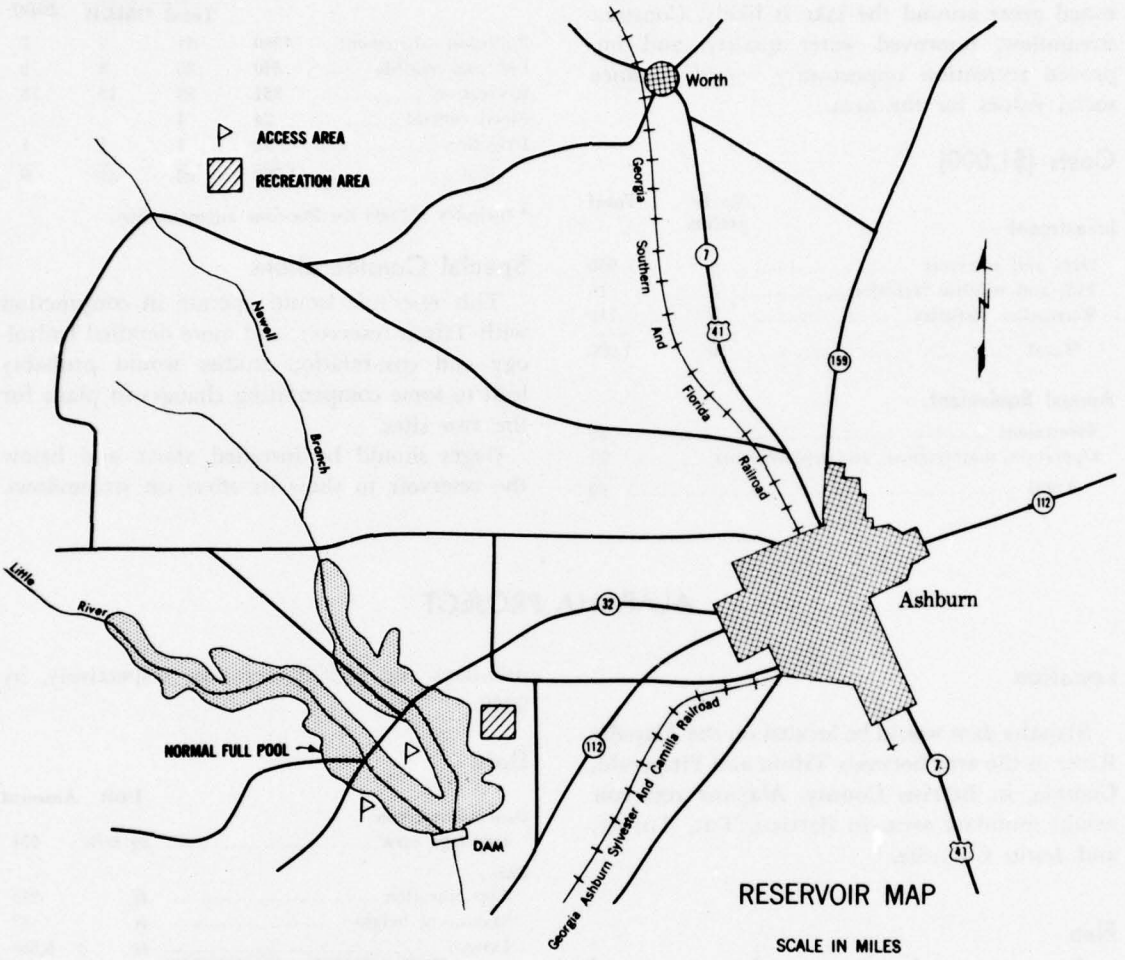
Annual Equivalent Primary Tangible ($1,000)

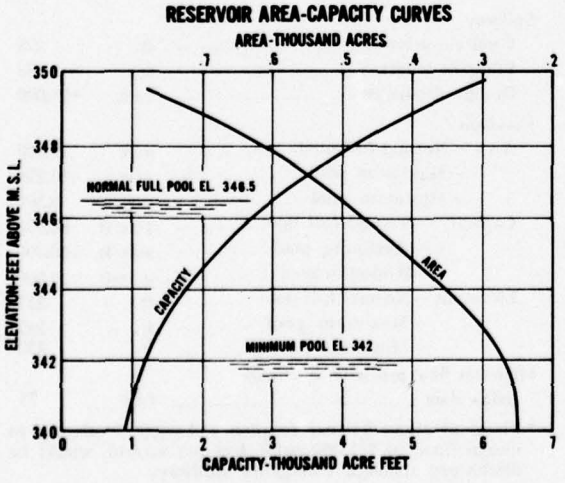
Pollution abatement	43
Fish and wildlife	26
Recreation	73
Flood control	2
Irrigation	1
Total	145

Impacts

Stabilizing flows in Little River in this headwater area would provide an inducement for industrial development. Land values around the

ASHBURN PROJECT





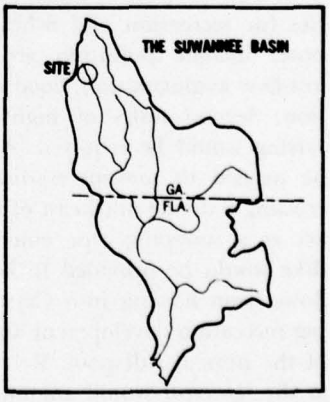


Figure 4.19

reservoir area would probably increase, more than offsetting the tax-base value of the inundated area. Homesite or cottage development in zoned areas around the lake is likely. Constant streamflow, improved water quality, and improved recreation opportunity would enhance social values for the area.

Costs ($1,000)

Investment	Early action	Total
Dam and reservoir	0	960
Fish and wildlife facilities	0	15
Recreation facilities	0	115
Total	0	1,090

Annual Equivalent	
Investment	39
Operation, maintenance, and replacements	29
Total	68

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	*380	21	7	7
Fish and wildlife	340	20	8	8
Recreation	334	25	13	13
Flood control	24	1	---	---
Irrigation	12	1	1	1
Total	1,090	68	29	29

* Includes $75,000 for low-flow augmentation.

Special Considerations

This reservoir would operate in conjunction with Tifton reservoir, and more detailed hydrology and cost-relation studies would probably lead to some compensating changes in plans for the two sites.

Gages should be installed above and below the reservoir to show its effect on streamflows.

ALAPAHA PROJECT

Location

Alapaha dam would be located on the Alapaha River in the area between Tifton and Fitzgerald, Georgia, in Berrien County. Alapaha reservoir would inundate areas in Berrien, Tift, Turner, and Irwin Counties.

Plan

The project would consist of an earthfill dam with a gated spillway and a reservoir with facilities for recreation and fishing use. Other purposes include pollution abatement, including low-flow augmentation, flood control, and irrigation. Several miles of highway relocations or raising would be required. A short dike would be needed to prevent normal floodflows from crossing a divide northeast of the damsite and to act as a fuse-plug type emergency spillway. A dike would be provided to keep extreme floodflows from flowing into Crystal Lake, an existing recreation development above the upper end of the normal full pool. Recreation and fishing at the reservoir would amount to about 250,000 user-days and 59,900 user-days, respectively, by 2000.

Data

	Unit	Amount
Dam and reservoir		
Drainage area	sq. mile	631
Dam		
Top elevation	ft.	245
Maximum height	ft.	37
Length	ft.	5,368
Spillway		
Crest elevation	ft.	225
Effective length	ft.	128
Design discharge	c.f.s.	*35,000
Reservoir		
Area — Normal full pool	acre	10,200
— Maximum pool	acre	15,200
— Minimum pool	acre	5,300
Capacity — Normal full pool	acre-ft.	84,000
— Maximum pool	acre-ft.	146,000
— Minimum pool	acre-ft.	36,000
Elevation — Normal full pool	ft.	237
— Maximum pool	ft.	242
— Minimum pool	ft.	230
Minimum flow provided in stream below dam	c.f.s.	75

* Flood of about 75-year frequency. Larger floods, up to design flood of 155,000 cubic feet per second, would be discharged through emergency spillway.

ALAPAHA PROJECT

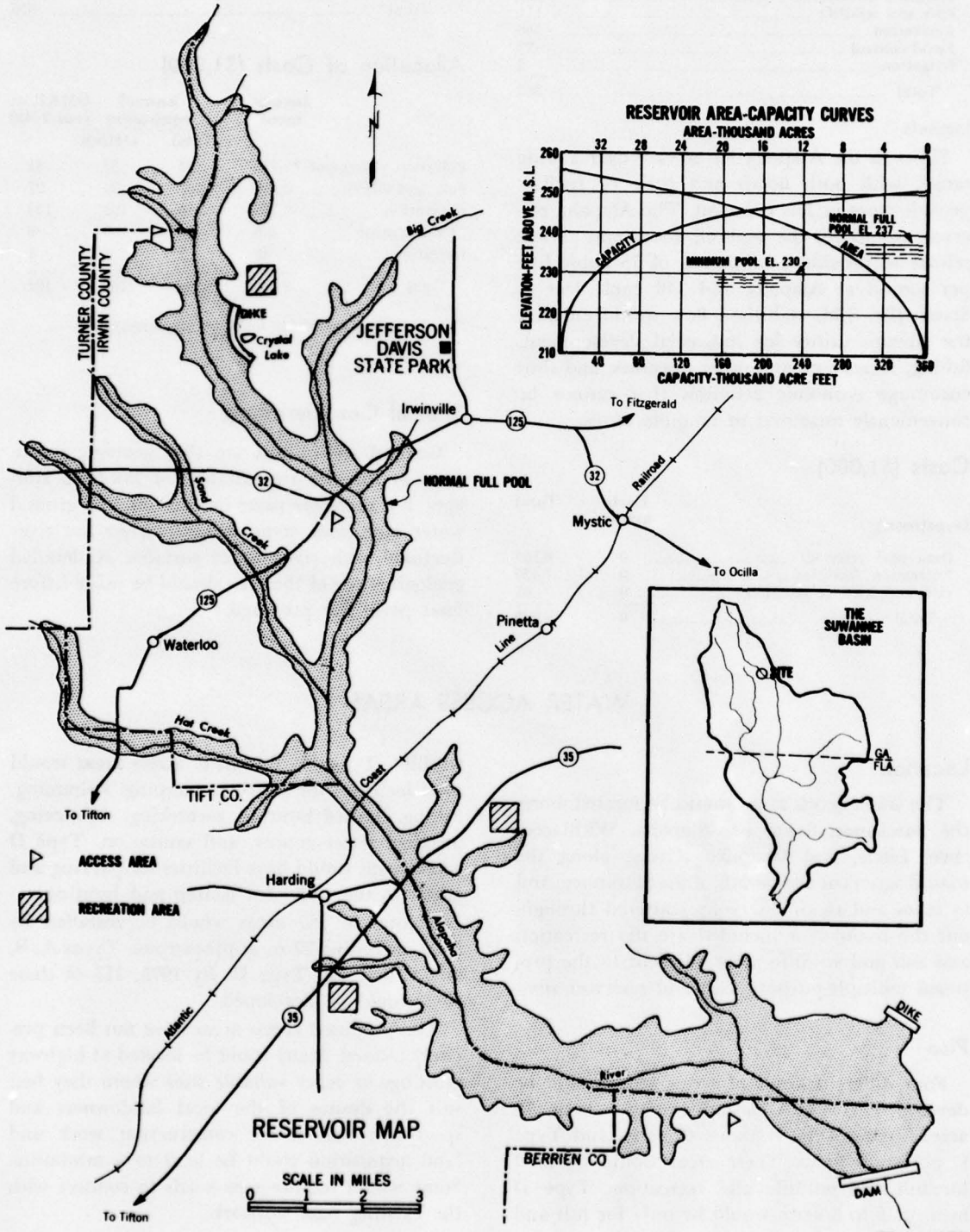


Figure 4.20

Benefits

Annual Equivalent Primary Tangible ($1,000)

Pollution abatement	227
Fish and wildlife	111
Recreation	500
Flood control	23
Irrigation	2
Total	863

Impacts

Flows in the Alapaha River vary over a wide range, with both floods and little or no-flow periods more or less common. The Alapaha reservoir would cut the peak off floods and permit release to provide a minimum of 75 cubic feet per second at Alapaha and 140 cubic feet at Statenville. This stabilized flow would enhance the streams utility for industrial development, fishing, recreation, and other purposes, and thus encourage economic activities that cannot be conveniently measured in tangible terms.

Costs ($1,000)

Investment	Early action	Total
Dam and reservoir	0	8,165
Recreation facilities	0	1,430
Fish and wildlife facilities	0	45
Total	0	9,640

Annual Equivalent	Total
Investment	348
Operation, maintenance, and replacements	188
Total	536

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	*1,730	94	31	31
Fish and wildlife	2,240	107	26	27
Recreation	5,230	310	121	123
Flood control	400	23	9	9
Irrigation	40	2	1	1
Total	9,640	536	188	191

* Includes $1,445,000 for low-flow augmentation.

Special Considerations

General indications are that geologic conditions at the site are suitable for low-head storages, but there are some indications that ground water elevations some distance from the river fluctuate with river water surfaces. A detailed geologic study of the area should be made before final plans are prepared.

WATER ACCESS AREAS

Location

The water-access areas would be located along the Suwannee, Santa Fe, Alapaha, Withlacoochee, Little, and Okapilco Rivers; along the coastal waters at the mouth of the Suwannee; and at lakes and small reservoirs scattered throughout the basin. Not included are the recreation and fish and wildlife areas adjacent to the proposed multiple-purpose dam and reservoir sites.

Plan

Four different kinds of access areas would be developed. Type A would average about 75 acres in size, Type B about 40 acres, and Type C about 10 acres. These areas would be used for fish and wildlife and recreation. Type D areas of 2 to 5 acres would be only for fish and wildlife. Types A, B, and C access areas would have facilities for boating, camping, swimming, fishing, limited hunting, picnicking, sightseeing, parking, water supply, and sanitation. Type D access areas would have facilities for parking and access to the water for fishing and hunting.

A total of 167 areas would be installed by 2000, including 27 multiple-purpose Types A, B, and C and 140 Type D. By 1975, 115 of these sites would be developed.

The proposed access areas have not been precisely located. Many could be located at highway crossings or other suitable sites where they best suit the desires of the local landowners and sportsmen and where construction work and land acquisition could be held to a minimum. Some would require new roads to connect with the existing road network.

Data

Type	Type and use of access areas — 2000					
	Georgia			Florida		
	No.	User-days		No.	User-days	
		Recreation	Fish and wildlife		Recreation	Fish and wildlife
A	---	---	---	2	200,000	4,000
B	5	300,000	10,000	17	1,020,000	34,000
C	2	80,000	4,000	1	40,000	2,000
D	20	---	40,000	120	---	240,000
Total	27	380,000	54,000	140	1,260,000	280,000

The Suwannee basin streams would be improved for recreation and other use when the upstream storages are provided to permit maintenance of adequate flows to meet needs on a year-round basis. In order to reflect the relation between storage and stream use, part of the net benefits from the access points has been assigned to pollution abatement, and thus reflect an indirect allocation of storage costs for low-flow augmentation. The impacts of low-flow augmentation are not limited to access areas, but no other benefits were analyzed.

Benefits

Annual Equivalent Primary Tangible ($1,000)

	Georgia	Florida	Total
Recreation	526	1,667	*2,193
Fish and wildlife	24	116	140
Total	550	1,783	2,333

* Excludes $590,000 assigned to reservoirs for low-flow augmentation, and analyzed as a part of pollution abatement.

Impacts

The access areas provide a wide distribution of facilities, at low cost, to provide public access to the streams all over the basin. The use of private land along streams is becoming more and more restricted. While the restrictions are usually justifiable from the owner's point of view, they limit the use of the basin water bodies and are making fishing and other water-based activities more and more difficult. One of the main objectives of the access areas is to keep the fishing areas available to the public and, at the same time, protect the rights of private property holders.

The access sites would provide convenient points to reach the streams for fish and wildlife management, stream gaging and sampling, and other purposes outside the recreational fields.

Costs ($1,000)

Investment

	Early action	Total
Facilities		
Georgia	1,370	2,195
Florida	4,930	7,525
Total	6,300	9,720

Annual Equivalent

	Georgia	Florida	Total
Investment	50	300	350
Operation, maintenance, and replacements	110	421	531
Total	160	721	881

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Recreation	7,760	744	464	464
Fish and wildlife	1,960	137	67	67
Total	9,720	881	531	531

UPSTREAM WATERSHED PROJECTS

Location

The upstream watershed projects would be located throughout the basin.

Plan

It is estimated that multiple-purpose flood prevention and drainage projects will be developed on tributary streams draining some 2.1 million acres in the Suwannee basin between 1960 and 2000 including 0.5 million acres in Georgia and 1.6 million acres in Florida. The structural works of improvements would protect and provide for the improvement of agricultural lands and other areas. In addition, many of the desired land-use changes would be made possible by more effectively utilizing, protecting, and developing the land and water resources of the basin.

Upstream watershed projects will provide watershed protection, flood prevention, and water resources development for other purposes in the upstream areas. The structural works of improvement included would reduce the average annual floodwater and sediment damages occurring under existing conditions on a substantial area of flood plains in the small stream watersheds. Protection provided for these floodplain areas will enable landowners to use more intensively some highly productive areas which are now in low value production and use because of the existing flood hazards.

Many opportunities exist in the proposed reservoirs in the upstream watersheds for recreation facilities, for fish and wildlife developments, for storing water for other beneficial uses, and for reducing floodwater and sediment damages. To the extent the reservoirs are made available to and managed for public use, they will provide substantial portions of the projected needs for recreation and fish and wildlife as well as other purposes. In developing detailed plans for each of the upstream watersheds, the needs for all purposes should be considered and facilities included wherever needed and feasible. Adjustments in other proposals in the plan could and should be made for that portion of the projected needs met by the upstream reservoirs.

Changes in the criteria for technical assistance, project selection, evaluation, installation, and cost sharing due to legislative changes in national programs and policy which cannot be predicted, or increased local interest, or other factors could substantially change the estimate and result in a different rate of watershed project installations. The possibility of changes in the watershed program is recognized. Appropriate recognition of actual developments and resulting modifications can be accomplished as a part of keeping the comprehensive plan up to date.

Benefits

Annual Equivalent Primary Tangible ($1,000)

	Georgia	Florida	Total
Flood prevention	46	697	743
Drainage	71	779	850
Total	117	1,476	1,593

Impacts

Corrective measures to prevent soil erosion together with utilization of sediment storage capacities provided in upstream structures will reduce sediment storage requirements in downstream reservoirs. These benefits have not been evaluated in dollar terms. Other impacts are discussed in Section III.

Costs ($1,000)

Investment

	Early action	Total
Structural works		
Georgia	1,431	1,433
Florida	1,979	7,547
Total	3,410	8,980

Annual Equivalent

	Georgia	Florida	Total
Investment	52	271	324
Operation, maintenance, and replacements	14	84	98
Total	67	355	422

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Flood prevention	3,774	177	41	41
Drainage	5,206	245	57	57
Total	8,980	422	98	98

WATER SUPPLIES

Location

The water supply program is basinwide.

Plan

The water supply plan does not involve multiple-purpose developments in the Suwannee basin because all existing and planned facilities are based on use of the abundant ground supplies of the area.

Data

Improvements in domestic systems will require 3,200 new wells and rehabilitation and improvement of 12,600 existing wells, including the installation of about 4,800 pumps and pressure systems. The municipal water supply program involves improvements in 72 municipal and military systems. New or additional treatment facilities will be required at 66 locations; 74 elevated tanks will be needed, including some replacements; and most towns will need extensions of their distribution systems. It is anticipated that about 10 new industrial water supplies will be developed and that 6 existing systems will be expanded.

Benefits

Benefits from providing a water supply are assumed to equal or exceed the cost of obtaining, from the cheapest and most likely alternative source, a supply that is adequate in quantity and quality. In the Suwannee basin the alternative is another well in the principal aquifer. Since this aquifer is currently adequate and accessible at relatively low cost, the benefits used in comparative studies are low. Eventually, expanded drawdown cones will increase ground water pumping costs to the point where surface supplies will be more economical for some communities.

Present availability does not, in reality, diminish the value of water or the benefits from its use. The availability of good quality water in ample quantity determines, to a considerable extent, the degree of community and industrial development. The value of water to an area as a natural resource to be preserved for the future may be much greater than the cost of obtaining it under present conditions of supply and demand.

Costs ($1,000)

Investment

	Early action	Total
Georgia	8,585	15,210
Florida	4,265	7,230
Total	12,850	22,440

Annual Equivalent

	Georgia	Florida	Total
Investment	376	182	558
Operation, maintenance, and replacements	688	450	1,138
Total	1,064	632	1,696
Operation, Maintenance, and Replacements at Year 2000	1,366	888	2,254

The early action phase of the water supply program will involve practically all of the domestic supply program, about one-third of the municipal program, and about half of the industrial program. The domestic program is largely in the early action phase because the number of rural facilities will decrease as farms are consolidated and as municipal systems expand to serve more users around the city peripheries.

Allocation of Costs

All costs are allocated to domestic, municipal, and industrial water supplies.

NAVIGATION

Location

The proposed navigation development is located at the mouth of Suwannee River in the State of Florida.

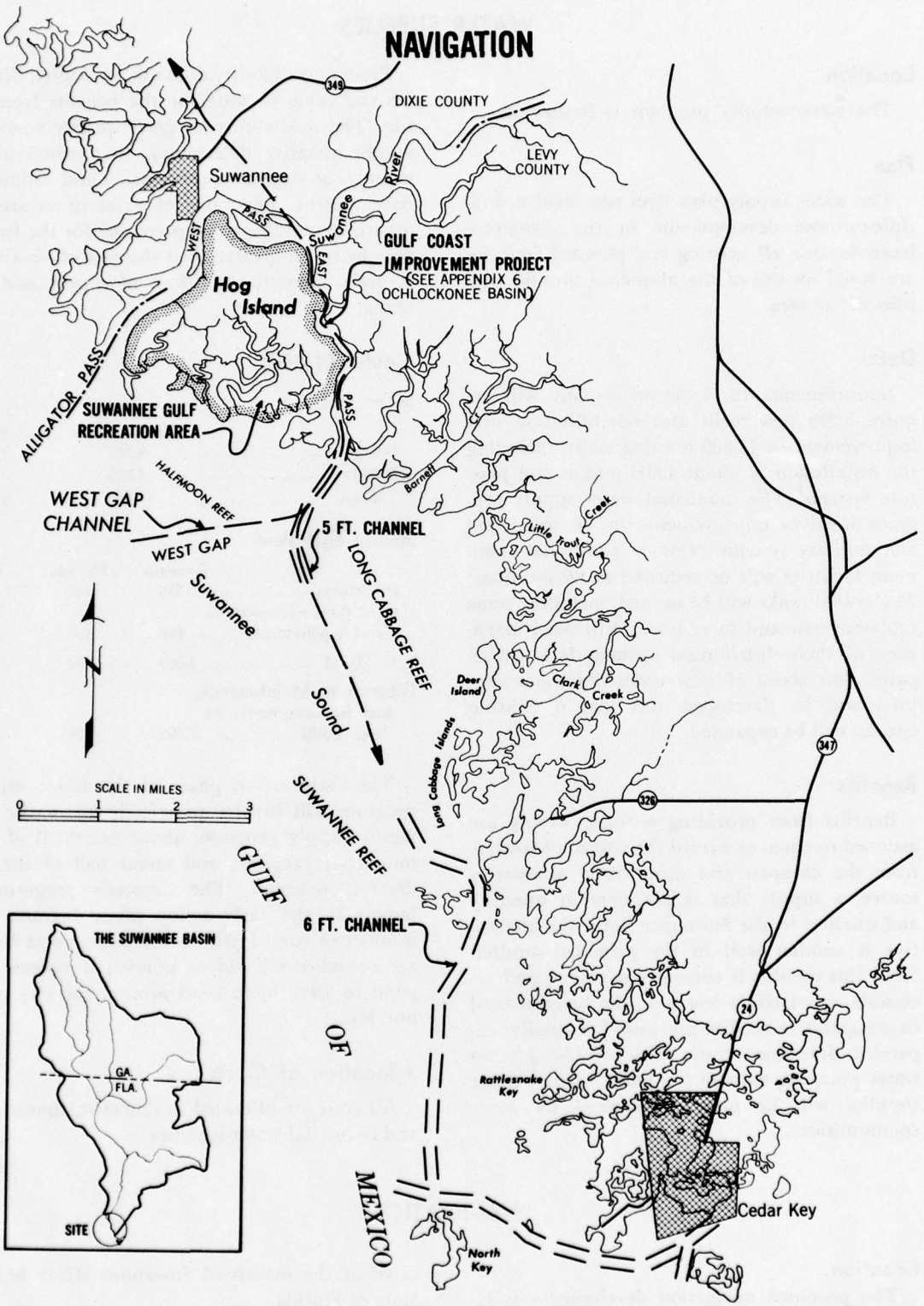

NAVIGATION
349
DIXIE COUNTY
LEVY COUNTY
Suwannee River
Suwannee
PASS
WEST
Suwannee
EAST
GULF COAST
IMPROVEMENT PROJECT
(SEE APPENDIX 6
OCHLOCKONEE BASIN)
Hog Island
ALLIGATOR PASS
SUWANNEE GULF
RECREATION AREA
PASS
Barnett
HALFMOON REEF
WEST GAP
CHANNEL
WEST GAP
5 FT. CHANNEL
LONG CABBAGE REEF
Little Trout Creek
Suwannee
Sound
Deer Island
Clark Creek
Long Cabbage Islands
347
326
SCALE IN MILES
0 1 2 3
SUWANNEE REEF
GULF
6 FT. CHANNEL
OF
MEXICO
THE SUWANNEE BASIN
GA.
FLA.
SITE
24
Rattlesnake Key
Cedar Key
North Key

Figure 4.21

Plan

The only new construction anticipated as a part of the Suwannee basin development is the small boat channel from East Pass to West Gap, as shown in Figure 4.21. The development is included in the early action phase. The proposed Gulf Coast Improvement project, which will provide a 12- x 200-foot navigation channel through East Pass, is included in plans for the Ochlockonee Basin, Appendix 6.

Benefits

Annual Equivalent Primary Tangible $11,000

Impacts

The boat channel discussed here and the Gulf Coast Improvement project shown in Appendix 6 will both enhance the utility of the Suwannee Gulf Recreation Area development on Hog Island. With the access provided by these navigation developments, the recreation area will be accessible to boats of 4- to 10-foot draft as well as to smaller boats and overland travelers.

Costs ($1,000)

Investment	Early action	Total
Channel dredging	70	70
Annual Equivalent		
Investment		2
Operation, maintenance, and replacements		7
Total		9
Operation, Maintenance, and Replacements at Year 2000		7

Allocation of Costs

All costs are allocated to navigation.

RECLAMATION, IRRIGATION, AND DRAINAGE

Location

The reclamation, irrigation, and drainage programs would be carried out on irrigable areas of the basin used for cropland and wetland areas used for cropland and pastureland. Drainage of woodland is discussed under Forest Conservation and Utilization.

Plan

The plan-by-purpose discussion in Section II covers the single-purpose and multiple-purpose aspects of the irrigation and drainage programs. The data below cover only that part of the total program that is not included in multiple-purpose developments.

Benefits

Annual Returns to Farmers ($1,000)

	Georgia	Florida	Total
Irrigation	3,435	1,576	5,011
Drainage	565	290	855
Total	4,000	1,866	5,866

Impacts

Irrigation would provide insurance against drought conditions and assist in prompt germination and continuous plant growth of new seedings. The survival of transplanted material, and the maturing of crops, would help in establishing vegetative cover on eroded areas and would provide for better use of land in accordance with its capability. Drainage also would provide for improved land preparation, seeding, cultivation, management, and harvesting. Other impacts are discussed in Section III.

Costs (exclusive of technical assistance) ($1,000)

Investment

	Early action	Total
Irrigation		
Georgia	2,911	5,178
Florida	1,370	2,382
Subtotal	4,281	7,560
Drainage		
Georgia	112	341
Florida	69	193
Subtotal	181	534
Combined program		
Georgia	3,023	5,519
Florida	1,439	2,575
Total	4,462	8,094

Annual Equivalent

	Georgia	Florida	Total
Investment			
Irrigation	188	86	274
Drainage	13	7	20
Subtotal	201	93	294
Operation, Maintenance, and Replacements*			
Irrigation	942	433	1,375
Drainage	13	5	18
Subtotal	955	438	1,393
Total			
Irrigation	1,130	519	1,649
Drainage	26	12	38
Total	1,156	531	1,687

* Operation, maintenance and replacements costs for the year 2000 are assumed to be equal to the annual equivalent operation, maintenance, and replacements.

Allocation of Costs

All costs are allocated to irrigation and drainage as shown.

SOIL CONSERVATION AND UTILIZATION

Location

The soil conservation and utilization program would be carried out on the cropland, pastureland, and rangeland throughout the basin.

Plan

The plan for the soil conservation and utilization program is summarized in the plan-by-function statement in Section II. It involves protection of land against erosion and soil deterioration; rebuilding of eroded and depleted soils; and increasing yields and farm and ranch income through proper land use and applied technology.

Benefits

Annual returns to farmers from the soil conservation program average $4,860,000; Georgia—$2,303,000 and Florida—$2,557,000.

Costs (exclusive of technical assistance) ($1,000)

Investment

	Early action	Total
Georgia	5,564	13,120
Florida	3,867	8,800
Total	9,431	21,920

Annual Equivalent

	Georgia	Florida	Total
Investment	474	318	792
Operation, maintenance, and replacements	1,022	872	1,894
Total	1,496	1,190	2,686

Operation, Maintenance and Replacements at Year 2000 — 1,894

Allocation of Costs

All costs are allocated to soil conservation and utilization.

FOREST CONSERVATION AND UTILIZATION

Location

The forestry program would involve timberland throughout the basin on both privately and publicly owned land.

Plan

The forest conservation and utilization program has many beneficial effects outside of the forestry field. These effects have been recognized in the plans for and returns from other purposes, so the forestry program, as it is used in these studies, covers only the timber and naval-stores production. The essential information about the program is given in Section II.

Data

Item	Unit	Georgia	Florida	Total
Fire protection (new)	acre	—	199,000	199,000
Fencing for woodland grazing control	mile	565	1,600	2,165
Erosion control tree planting	acre	16,000	11,000	27,000
Woodland drainage and water control	acre	195,000	705,000	900,000
Shelterbelts	acre	5,000	3,000	8,000
Timber-stand improvement (commercial and noncommercial)	acre	2,050,000	2,060,000	4,110,000
Other tree planting and site preparation for natural regeneration	acre	1,460,000	1,470,000	2,930,000
Annual Production — 2000				
Timber cut (million)	cu. ft.	150	155	305
Gum-naval stores (thousand)	bbl.	345	50	395

Benefits

Annual Equivalent Primary Tangible ($1,000)

Georgia	3,533
Florida	3,200
Total	6,733

Impacts

Forestry impacts are discussed in Section III of this Part.

Costs ($1,000)

Investment

	Early action	Total
Georgia	21,200	40,450
Florida	24,620	46,390
Total	45,820	86,840

Annual Equivalent

	Georgia	Florida	Total
Investment	985	1,130	2,115
Operation, maintenance, and replacements	1,000	774	1,774
Total	1,985	1,904	3,889

Operation, Maintenance, and Replacements at Year 2000 — 2,210

Allocation of Costs

All costs are allocated to forestry.

FISH AND WILDLIFE

Location

The fish and wildlife program is dispersed throughout the basin.

Plan

The overall fish and wildlife program involves both multiple-purpose projects and single-purpose projects, programs, and facilities. Significant details of the multiple-purpose parts of the plan are given in this Section in the project data sheets for each multiple-purpose project. The information here covers the fish and wildlife aspects not included in multiple-purpose developments.

Most of the fish and wildlife program involves expenditures that are made on a year-to-year basis for management, technical services, habitat improvement, stocking and other activities that involve comparatively small amounts of capital investment in permanent facilities. These annual expenditures are made throughout the basin but in varying relations from year to year, depending on habitat conditions, hunting and fishing pressures, and other related factors.

The wildlife program would consist of (1) improvement of habitat in seven existing State administered wildlife management areas; (2) development of habitat within the Okefenokee Swamp to encourage more use by waterfowl; (3) development of three new upland game management areas; (4) development, locally, of at least 1,000 acres of small impoundments in the coastal marshes of river flood plains for waterfowl purposes; (5) development of wildlife habitat throughout the basin by interested

landowners in cooperation with State and Federal conservation agencies; and (6) expansion of current activities in planning, education and information, and management and enforcement. These programs would provide about 449,000 user-days of hunting annually, by the year 2000, including 9,000 to offset losses resulting from inundations.

The sport fisheries program would consist of (1) improvement of the existing lakes and streams; (2) renovation and more intensive management of the larger of the existing small impoundments; (3) improvement of existing services and facilities for coastal fishermen, including installation of artificial reefs; and (4) expansion of current activities in planning, education and information, and management and enforcement. These activities would provide for about 922,000 user-days, of fishing by the year 2000, including 334,000 associated with access areas.

The commercial fisheries program would consist of (1) expansion of existing operations; (2) cultivation of shrimp, oysters, pompano, and other high quality food fishes under controlled conditions; and (3) acceleration of going programs and expansion of existing facilities with a view toward more efficient harvesting, better methods of handling and processing catch, new sources of supply, sound regulations and enforcement, and increasing demand for domestic products. With this program in effect, and considering the advantage of improved equipment and technology, it is anticipated that the total production of food fish will be increased to 2 1/4 million pounds annually by 1975, and 3 2/3 million pounds by 2000.

Benefits ($1,000)

Annual Equivalent Primary Tangible

	Georgia	Florida	Total
Sport fish and wildlife	951	946	1,897
Commercial fish	—	130	130
Total	951	1,076	2,027

Costs ($1,000)

Investment

	Early action		Total	
	Georgia	Florida	Georgia	Florida
Sport fish and wildlife	....	80	....	350
Commercial fish	....	68	....	68
Total	....	148	....	418

Annual Equivalent

Investment	Georgia	Florida	Total
Sport fish and wildlife	—	7	7
Commercial fish	—	2	2
Total	—	9	9
Operation, maintenance, and replacements			
Sport fish and wildlife	833	490	1,323
Commercial fish	—	106	106
Total	833	596	1,429
Total			
Sport fish and wildlife	833	497	1,330
Commercial fish	—	108	108
Total	833	605	1,438

Operation, Maintenance and Replacements at Year 2000

Sport fish and wildlife	2,207
Commercial fish	196
Total	2,403

Allocation of Costs

All costs are allocated to fish and wildlife.

RECREATION

Location

The recreation program is interwoven in the comprehensive plan of development. Recreation is a purpose in all the specific projects involving the storage and regulation of water, in access areas, and in the Gulf Coast Waterway. The recreation programs in these specific multiple-purpose projects are described and summarized with the other functions in the project data for each proposed development.

Data for all the recreation program except that associated with multiple-purpose projects are in this Section of the Report. Descriptive material for existing developments supplements that given in Section II—Plan by Purpose. The

single-purpose developments will be dispersed throughout the basin.

Plan

The recreation program includes expanded use of 15 areas in the basin which are now developed to some degree as public recreation areas. They range from small parks developed for high-density use to large areas offering a wide range of activities. The degree of expansion would vary considerably, depending on the refinement of existing developments and other related factors. In general, the use of existing facilities is expected to about double by 1975 and to increase to about five times present use by the year 2000. Many new areas would be developed which would offer increased public outdoor recreation opportunities and would provide a balanced plan of development.

Data

It is expected that use of the Crystal Lake area would expand to 100,000 user-days in 1975 and 200,000 user-days by the year 2000. Additional facilities will be needed for picnicking, camping, and swimming. Crystal Lake lies adjacent to the proposed Alapaha reservoir, but it will be protected by diking to insure against any possibility of inundation during flood periods.

Jefferson Davis Memorial State Park would have facilities to accommodate 50,000 visitors in 1975 and 150,000 user-days in the year 2000.

Cook-Colquitt Recreation Area is being developed to its capacity by the State of Georgia and Cook and Colquitt Counties, and no additional facilities are proposed.

Banks Lake is now used primarily for fishing. It is proposed that privately owned portions of the lake be acquired or that public use be assured by appropriate agreement and that facilities for boating, swimming, picnicking, camping, fishing, and sightseeing be provided to meet the needs of 40,000 users by 1975 and 100,000 by the year 2000. Cypress trees stand in the lake some distance from shore, but there are large, open areas that would permit all kinds of boating and still leave adequate areas undisturbed for small-boat fisherman, sightseer, and swimmer.

Okefenokee Swamp Park makes accessible to the public facilities and interpretive devices to describe the ecology of this unique area. Facilities with be enlarged to accommodate 250,000 user-days by 1975 and 500,000 user-days by the year 2000.

Okefenokee National Wildlife Refuge would be maintained as a primitive area dedicated to the preservation of wildlife and the vast natural phenomena of the area. However, interpretive facilities would be provided for 100,000 user-days by 1975 and 300,000 user-days by the year 2000. Use of the swamp for fishing should be continued.

Stephen C. Foster State Park provided about 18,500 user-days in 1960. It is expected to meet the needs for 36,000 user-days by 1975 and 100,000 user-days by 2000. Additional facilities will be needed for improved access, parking, water supply and sanitation, and for some expansion of the picnicking and camping areas.

Suwannee River State Park had a visitation of about 55,000 user-days in 1960. It is expected that facilities will be needed for 200,000 visitors in 1975 and 700,000 visitors in the year 2000. Activities will include family and group camping, swimming, picnicking, and cultural activities. The park would be a key point on the proposed Suwannee River Recreation Road. Suwannee County has qualified for assistance under the Area Redevelopment Administration program, and further development of the park might be an appropriate means of providing employment and meeting other Area Redevelopment Administration objectives.

The Stephen Foster Memorial is becoming increasingly popular, and its use will be enhanced by the proposed Suwannee River Recreation Road. It is estimated that facilities will be needed for 350,000 visitors by 1975 and for 850,000 by the year 2000. The existing park covers 243 acres, an adequate area for foreseeable future development.

Osceola National Forest provided about 102,000 user-days of recreation in 1960, largely at Ocean Pond. Additional facilities are needed for camping, hiking, picnicking, and cultural activities to satisfy a need for 200,000 user-days by 1975 and 800,000 user-days by the year 2000. Approximately 110,000 acres of the forest lie within the Suwannee basin.

The Olustee Battlefield State Memorial will need additional facilities by 1975 to accommodate 50,000 user-days of sightseeing. About 90,000 user-days are anticipated for the year 2000.

Ichetucknee Spring could be developed into an extraordinarily beautiful recreation area. The plan for development includes acquisition of about 50 acres with facilities for swimming, picnicking, and camping to meet the needs of 20,000 user-days by 1975 and 50,000 user-days by 2000. The Ichetucknee River is one of the most beautiful streams of the basin, and public control of the entire stream should be considered when acquisition is undertaken.

O'Leno State Park has attractive facilities for picnicking and group camping, and its primary local use will probably continue to center around these activities and hiking and swimming. Additional interpretive facilities are needed to capitalize on the unusual geologic phenomena of the area. The park load is expected to reach 100,000 user-days by 1975 and 300,000 user-days by the year 2000.

Hart Spring has attractive facilities for swimming, picnicking, and fishing. Use is expected to increase to 150,000 user-days in 1975 and 500,000 user-days by the year 2000 and would require additional facilities for parking, sanitation, boating, and other use.

Manatee Spring State Park provided about 52,000 user-days in 1960 which is expected to increase to 150,000 and 500,000 user-days by 1975 and 2000, respectively, through expansion and more intensive use development that is now underway.

The Cedar Keys Wildlife Refuge would be developed to provide minimum facilities to permit bird observation for 4,000 users in 1975 and for 20,000 by the year 2000. The facilities would be designed so that they would not interfere with the primary purpose of the refuge.

Suwannee River Recreation Area provides for a scenic road to extend from White Springs through Ellaville, Dowling Park, Mayo, Branford, Rocks Bluff, Fannin Springs, and along the existing highway below Manatee Spring. There would be about 90 miles of new road and 10 miles of improved road. The new sections would be all-weather roads but would be designed for low-speed use by recreationists and local residents and not for through highway traffic. Over 20 ten-acre wayside areas at about 5 mile intervals, would have facilities for sightseers. This project would accommodate 2,245,000 users in 1975 and 4,050,000 users in 2000.

Suwannee Gulf Recreation Area is proposed as a new development on 2,250-acre Hog Island that lies between East Pass and West Pass at the mouth of the Suwannee River in Levy County, Florida. The town of Suwannee, a fishing and recreation center, lies across West Pass from the island. The proposed park would provide the only salt-water recreation development in the basin. Access would be provided to the island by construction of a bridge over West Pass, and canals into an inland marina will provide access for recreationists who come to the park by boat. Eventually, the Gulf Coast Improvement project with a 12-foot channel depth will pass the island via East Pass, making the area accessible to ocean-going pleasure craft. The highway associated with the Gulf Coast Improvement project would also cross the northern tip of the island, putting the park on a major highway. These latter developments are of primary concern to the Ochlockonee basin and are discussed in more detail in Appendix 6.

In addition to the access provided by the existing boat channels and the Gulf Coast Improvement project, navigation plans for the basin include construction of a 5-foot channel from East Pass to the Gulf via West Gap, thus permitting direct access to open water from the vincinity of the park. Spoil from the various excavations that are anticipated within or adjacent to the park area would be used for landfill to raise the elevation of the lower parts of the island to an elevation above storm tides. While the park is envisioned as a day-use and camping area, it is large enough to permit zoning some areas for commercial tourist housing and related facilities should that course be found desirable. As planned, it is expected that the park would provide 300,000 user-days by 1975 and 1,400,000 user-days by the year 2000, the latter figure including 800,000 that would come to the area as a result of the Gulf Coast Improvement project.

Other possibilities for development include Indian War fort sites, the Seminole Indian trails;

and Falmouth River, a spring-fed disappearing stream near Ellaville, Florida, reported by Ripley's "Believe It or Not" to be the world's shortest river.

The proposed level of development at single-purpose recreation areas included in the plan would provide an opportunity for the following estimated use of facilities.

	User-days annually (thousands)		
	1960 Base	By 1975	By 2000
Existing Developments			
Crystal Lake	50	100	200
Okefenokee Swamp Park	150	250	500
Hart Spring Park	100	150	500
Ichetucknee Spring	5	20	50
Manatee Spring State Park	100	150	500
Suwannee River State Park	100	200	700
Stephen C. Foster State Park	20	36	100
O'Leno State Park	50	100	300
Banks Lake	10	40	100
Cedar Keys National Wildlife Refuge	1	4	20
Osceola National Forest	150	200	800
Okefenokee National Wildlife Refuge	—	100	300
Olustee Battlefield State Memorial	40	50	90
Stephen Foster Memorial	250	350	850
Jefferson Davis Memorial State Park	50	50	150
New Developments			
Suwannee River Recreation Area	....	2,245	4,050
Suwannee Gulf Recreation Area	....	300	*1,400
Total	1,076	4,345	*10,610

* Includes an 800,000 user-day increase between 1975 and 2000 associated with the Gulf Coast Improvement project and evaluated in Appendix 6, Ochlockonee Basin.

Benefits

Annual Equivalent Primary Tangible ($1,000)

Georgia	582
Florida	4,062
Total	4,644

Impacts

The value added to the economy by expenditures made by recreationists is generally recognized. Less tangible are the benefits derived from general enhancement of the recreational opportunities in a given locality. The growth of many cities and towns in the basin would depend to a great extent on their attractiveness and proximity to land and waters affording good opportunities for recreation, fishing, and hunting.

Recreation impacts are discussed in more detail in Section III of this Part.

Costs ($1,000)

Investment	Georgia	Florida	Total
Early action			
Existing areas	1,680	3,350	5,030
New areas	—	7,590	7,590
Total	1,680	10,940	12,620
Total (1960-2000)			
Existing areas	4,610	8,930	13,540
New areas	—	10,070	10,070
Total	4,610	19,000	23,610
Annual Equivalent			
Investment	106	632	738
Operation, maintenance, and replacements	155	990	1,145
Total	261	1,622	1,883
Operation, Maintenance, and Replacements at Year 2000	286	1,501	1,787

Allocation of Costs

All costs would be allocated to recreation.

POLLUTION ABATEMENT AND PUBLIC HEALTH

Location

The pollution abatement and public health program is basinwide.

Plan

The pollution abatement program includes single-purpose facilities for waste treatment, por-

tions of multiple-purpose developments to provide water for low-flow augmentation to keep streams alive and useful throughout their reaches, and continuing programs for operation and maintenance of facilities. Protection of public health is an integral part of all projects and programs and is recognized in their costs and benefits. Programs for insect and rodent control, solid-waste disposal, prevention of air pollution, and surveillance of general health conditions are outlined in Section II.

Streams in the upper portion of the Suwannee basin have historically dried up during periods of low rainfall. Even if properly treated, waste effluents into dry or near-dry streams create nuisances if not health hazards. Live streams are important factors in determining locations for prospective industries and other developments. In order to recognize the need for low-flow augmentation, some access-area benefits were assigned to water quality control and are reflected, along with pollution abatement, in allocations of reservoir costs. The methods used in making this assignment are discussed in Appendix 12, Part Four.

Benefits

Annual benefits for sewerage systems, treatment facilities, and public health programs are not expressed in monetary terms.

Costs ($1,000)

Investment

	Early action	Total
Georgia	16,610	26,940
Florida	7,880	13,160
Total	24,490	40,100

Annual Equivalent

	Georgia	Florida	Total
Investment	684	332	1,016
Operation, maintenance, and replacements	911	468	1,379
Total	1,595	800	2,395

Operation, Maintenance, and Replacements at Year 2000 1,742

Allocation of Costs ($1,000)

	Investment	Annual equivalent		OM&R at year 2000
		Total	OM&R	
Pollution abatement	40,100	1,389	373	736
Public health	0	1,006	1,006	1,006
Total	40,100	2,395	1,379	1,742

RURAL ZONING

Location

There is a need for rural zoning in the Suwannee basin, particularly along the Suwannee River between White Springs and the mouth and along the lower reaches of Santa Fe, Alapaha, and Withlacoochee Rivers. These areas remain largely in their natural, attractive state. They have great potential value for residential, industrial, recreational, and other uses that could be kept in harmony if such development is undertaken in an orderly fashion.

Plan

Rural zoning could best be handled at the local level. It can and should be a cooperative agreement decided upon by the people directly interested in the area to be zoned. In the Suwannee basin, it could be handled on a county basis or through the medium of broader organizations such as the Suwannee River Authority. Enabling legislation has been provided in both Florida and Georgia, but further legislative action may be needed to provide whatever instructions or limitations the States consider appropriate to prevent any improper or unfair use of zoning tools and to insure that the adopted regulations reflect areawide needs.

As a practical matter, zoning regulations cannot appropriately be used to force the removal of an objectionable property use existing at the time of zoning. Zoning looks mainly to the future and is most effective only if used before blight occurs. Its objective is to achieve reasonable harmony between private development of properties for residential, business, and industrial uses, and public plans for future investments in roads, water supplies, sewer systems, schools, parks, and related public works.

In order to be effective, zoning regulations must be based on a well-thought-out master plan that encompasses as many of the potential needs

of the area as can reasonably be foreseen. The plan must also be flexible enough to permit adjustments in long-range goals without requiring a reorientation of the whole program. Without long-range objectives, zoning can be as haphazard as uncontrolled development and perhaps as detrimental. It should be undertaken only on a carefully planned basis.

In the Suwannee basin, the background information needed for establishing some type and degree of zoning is available, and the need is evident. A delay will inevitably make the problem more difficult and the results less satisfactory. Either with or without zoning, it is expected that the banks of the Suwannee River and its major tributaries, as well as major highway routes, will contain many developments of one type or another within the next quarter century.

Zoning agreements may take many forms and innumerable degrees of control can be provided. Some of the factors that seem worthy of consideration in the Suwannee basin are:

(1) Preserving a reasonable part of the area scenic attraction for local, regional, or national public use.

(2) Insuring that, whatever developments are undertaken, they are compatible with the flood problems expected to exist, after considering the advantages of expected future controls.

(3) Insuring opportunity for residential, business, industrial, and recreational developments within the limits of space available, and with an areal distribution that would be mutually advantageous rather than separably exclusive.

(4) Providing for concentration of developments within reasonable intervals of time, so that services, such as roads, schools, and water and sewer systems can be made available at reasonable cost.

(5) Insuring that domestic, business, and industrial wastes, both waterborne and airborne, are handled in a proper manner.

These needs are important to the people now living in the area, and they have other significant aspects. Industry will unquestionably continue to increase in importance as a part of the economy of the area. Pleasant living conditions are becoming a more significant factor in deciding where industry will locate, and where people will retire. The Suwannee basin cannot afford to lose the opportunity it now holds in this regard. People like to live near their place of employment and around the corner from a shopping center, but not in the backyard of either. It is proper, even in a free society, for local governments to provide group-type facilities for services only in specified locations, and to insist that those persons or firms locating elsewhere must meet the same health and other standards as an individual expense. By so doing, public costs can be kept within efficient bounds.

Benefits and Costs

Rural zoning can be carried out as one of the regular functions of local government. Benefits and costs for the program have not been identified.

SECTION VI – OTHER PROJECTS CONSIDERED

The studies leading to the comprehensive plan for Suwannee basin development involved consideration of many alternatives that were studied but were not included in the plan. Some of the more significant items that were eliminated and the reasons for their rejection are shown in the summary that follows. More detail for these and other alternatives are contained in Appendix 12, Planning.

Name of project not included in plan	Key number on Figure 4.22	Location	Description	Purpose*	Reason for not including in plan
Rochelle	1	On Alapaha River near Rochelle; several sites studied	Dam and reservoir	FC, PA, R, F&W, I	Not economically justified
Fitzgerald	3	On Willacoochee River near Fitzgerald, Ga.	Dam and reservoir	PA, R, F&W, I	Not economically justified
Ocilla	4	On Stump Creek near Ocilla, Ga.	Dam and reservoir	PA, R, F&W, I	Not economically justified
Warrior Creek	7	On Warrior Creek near Sylvester, Ga., with diversion to Okapilco Creek	Dam and reservoir	PA, R, F&W	Not economically justified
Adel	10	On Little River southwest of Adel, Ga.	Dam and reservoir	FC, PA, R, F&W, I	Part of site preempted by smaller Cook-Colquitt reservoir
Alapaha diversion	11	On Alapaha River near Stockton, Ga., to divert flood flows to St. Marys River via upper Suwannee River	Dam and small reservoir	P, FC, R, F&W	Power and flood control not justified; not essential for other purposes
Withlacoochee	14	Withlacoochee River just above mouth of Little River	Dam, reservoir, and powerplant	FC, P, R, I, F&W, PA	Questionable foundation conditions, high cost
Valdosta	15	On Withlacoochee River in vicinity of Valdosta; 10 sites were considered	Dam and reservoir	FC, PA, WS, R, F&W, I	Questionable foundation conditions; serious backwater problems
Fargo	19	On Suwannee River near the Ga.-Fla. State line to divert Alapaha and Suwannee *floodwater to Macclenny* reservoir in the St. Marys basin	Dam and reservoir	P, FC, R, F&W	Same as Alapaha diversion
Ellaville	21	On Suwannee River near Ellaville, Fla.	Dam and reservoir	N, FC, P, R	Not economically justified
White Springs	22	On Suwannee River near White Springs, Fla., to serve same purposes as Fargo	Dam and reservoir	P, FC, R, F&W	Same as Alapaha diversion
Steinhatchee Floodway	23	Suwannee River to Steinhatchee River	Flood control channel	FC	Not economically justified
Branford Levee	24	Branford, Fla.	Levee system	FC	Not economically justified
Santa Fe Boat Waterway	25	From Cross-Florida Barge Canal to Suwannee River	Improvement of Santa Fe River and connecting streams and lakes for recreational boating	R	Not economically justified
Bell	26	On Suwannee River near Bell, Fla.	Dam and reservoir	N, FC, P, R	Not economically justified

* FC —Flood control
WS —Water supplies
N —Navigation
I —Irrigation
P —Power
F&W—Fish and wildlife
R —Recreation
PA —Pollution abatement

PROJECTS CONSIDERED

SITES

1 ROCHELLE RESERVOIR
(2) ASHBURN RESERVOIR
3 FITZGERALD RESERVOIR
4 OCILLA RESERVOIR
(5) TIFTON RESERVOIR
(6) ALAPAHA RESERVOIR
7 WARRIOR CR. RESERVOIR
(8) MOULTRIE RESERVOIR
(9) NASHVILLE RESERVOIR
10 ADEL RESERVOIR
11 ALAPAHA DIVERSION DAM
(12) SHILOH RESERVOIR
(13) FRANKS CREEK RESERVOIR
14 WITHLACOOCHEE RESERVOIR
15 VALDOSTA RESERVOIR
(16) OKAPILCO RESERVOIR
(17) QUITMAN RESERVOIR
(18) MUD SWAMP RESERVOIR
19 FARGO RESERVOIR
(20) HIXTOWN MARSH RESERVOIR
21 ELLAVILLE RESERVOIR
22 WHITE SPRINGS RESERVOIR
23 STEINHATCHEE FLOODWAY
24 BRANFORD LEVEE
25 SANTA FE BOAT WATERWAY
26 BELL RESERVOIR

GULF OF MEXICO

Figure 4.22

PART FIVE – CONCLUSIONS

DISCUSSION

The Suwannee basin area has the potential for continued population and personal income growth through the year 2000. The projected rate of population growth is slower than that of the Nation and of the Southeast River Basins, primarily because of the lack of large urban areas. Gains in personal income are expected to be substantial but slightly less than the average for the Southeast River Basins. Realization of the projected levels of income depends upon a continuing rise in the productivity of the area workers as well as a large increase in the numbers employed.

Agriculture and forestry will continue as major factors in the basin economy, but the trend toward urbanization will accelerate, and industrial development and urban areas are expected to become more significant influences on future use of the basin land and water resources. With the shift toward an urban economy, which is part of a national trend, will come readjustments in urban-rural relations and influences. There will be increased emphasis on industrial development and problems connected with urbanization. For the rural economy, there will be increased emphasis on efficiency.

The comprehensive plan for the conservation and development of the area land and water resources, presented in Part Four, recognizes the rights and major responsibilities of the States and local interests in the development of the basin land and water resources. It provides that the major portion of the new resource development programs and facilities be initiated, developed, and maintained by non-Federal entities. It is designed to provide a framework for meeting immediate needs for land and water and, at the same time, maintain or establish a setting attractive to people considering the basin as a place to live and to locate business enterprises.

To be effective, the plan must be implemented as a joint local, State, and Federal effort by completion of actual programs and projects. In most instances, more detailed analyses and evaluations will be necessary before programs and projects are started. Because the plan is based on long-range assumptions and projections, it will need frequent reviews and periodic revisions to insure that it is properly responsive to changing times and conditions.

Suwannee basin land, with presently known management skills and technical knowledge, can produce food and fiber at several times the present rate and is more than adequate to meet the basin projected share of regional and national requirements for the year 2000. Steps need to be taken to conserve for future generations the basic soil and water resources. The non-agricultural requirements for land will cause no serious restriction on agricultural production, and there is adequate land for the projected growth of urban areas with the accompanying industrial and service activities. Water, generally, is distributed favorably in relation to development possibilities, but surface water supplies are not always available to meet seasonal needs. If properly developed, sufficient water is available to meet all foreseeable requirements for human comfort and health and for needed expansion of industry, recreation, agriculture and forestry, and for fish and wildlife.

CONCLUSIONS

The Commission concludes:

(1) Flood damages are locally significant on the Suwannee River and tributary streams but are low with relation to the area flooded because there is comparatively little flood plain development. Encroachment has begun and flooding could become a major problem unless zoning or other control measures are adopted for flood-prone areas. Projects and programs in the comprehensive plan would alleviate the major flood

problems in the more critical areas but would not eliminate them. Flood problems can be kept from arising in many other areas by proper flood plain management.

(2) Substantial quantities of ground water are available in the basin, and there are no major water supply deficiencies. Water quality is generally suitable for most uses, and waters are amenable to treatment for the other uses. Water supply systems, both domestic and municipal, will need major improvements or expansion during the 1960-2000 period.

(3) Inland navigation is not warranted as a commercial enterprise. The use of streams and coastal areas for recreational boating is provided for in the comprehensive plans.

(4) Projected requirements for food and fiber can be met through a continuation and acceleration of current practices and programs, with some land-use changes. Individual operators are expected to install drainage and irrigation facilities for efficiency, increased yields, and improved uniformity in agricultural products. Marginal lands now in crop production would then be put in pastureland, woodland, or other uses. Truck farming and cattle raising are expected to become more significant parts of the agricultural program.

(5) No hydroelectric power development proposals are included in the plan. Some small developments by private or other interests may be found feasible when final plans for proposed reservoirs are prepared.

(6) Industrial expansion is a key factor in supporting the projected income growth in the area. The levels of industrial growth reflected by projections are practicable of attainment with a concerted effort by community leaders to establish a suitable legal, institutional, social, and political environment with conditions favorable for financing, education, and training.

(7) Adequate conservation treatment has been applied on about 50 percent of the cropland, pastureland, and rangeland of the area. However, the application of erosion control and other conservation treatment measures must be continued and expanded to conserve soil and water resources and contribute to increased efficiency in production.

(8) Annual merchantable wood growth now exceeds the annual harvest and mortality. Projected levels of production can be met by the year 2000 if accelerated protective management programs are carried out.

(9) The proposed wildlife and sport fisheries developments can meet the needs for hunting and fishing opportunity. More intensive management of existing habitat and development of new management areas at strategic locations are key items in the plan.

(10) Despite the natural productivity of the Gulf of Mexico, it will become increasingly difficult to harvest wild fish crops at costs permitting commercial fishing industries to compete with imports and the mass production and marketing methods of other food industries. The plan includes new programs and improved facilities for producing and harvesting fishes for food and industrial purposes.

(11) Demands for outdoor recreation are rapidly exceeding the capacity of developed facilities in the area, particularly in the vicinity of major transportation routes. Many out-of-basin residents are expected to seek recreation in the Suwannee basin. Extensive recreation development is an integral part of the development plan.

(12) Soil salinity is generally not a problem in the basin. Salt-water intrusion of fresh-water aquifers is not now a major problem and potential future problems can be obviated by judicious withdrawals, by shifts to alternative sources, or by a combination of these measures. Sedimentation problems are generally not serious, but wind and water erosion are critical in some local areas. Satisfactory sediment control can be achieved largely through conservation practices.

(13) Waste water from some sources is adequately treated, but much raw or inadequately treated sewage and industrial waste is still discharged directly into streams and lakes. As population grows and industry expands, the pollution problems will intensify unless adequate waste treatment can be provided and waste loadings reduced to assure stream water quality suitable for reuse. Many streams dry up during periods of low rainfall, and low-flow augmentation is a primary need that would be met by planned facilities.

(14) Beach erosion is not significant in the coastal areas of this basin. Hurricane damage is a problem. Additional studies would be required to evaluate the problem and to find a suitable solution.

(15) The non-Federal costs of plan implementation, operation, maintenance, and replacements are within the financial capabilities of the basin, but some outside assistance in financing may be required. Federal assistance is suggested for the Franks Creek-Mud Swamp recreation and fish and wildlife complex to determine and demonstrate how such projects can contribute to local and regional economies on a self-supporting basis.

(16) In the course of implementing the comprehensive plan and keeping it responsive to changing conditions, recognition should be given to the existing water laws in relation to the development contemplated in the plan. The riparian doctrine is the basis for current water laws throughout the study area. The doctrine has been variously interpreted by legislative action and court decision reflecting, among other things, the reasonable use concept. Conflicts over surface and ground water use have not been widespread in the past because of the relative abundance of water. As water uses increase, there will be more competition for the available supplies. Optimum water development will sometimes require the storage of surplus flows for use at points considerable distances from the site in which the flows are stored and often in another State. Some agreement among the interested groups—local, State, and Federal—will be needed to insure that the distribution of stored water will conform to the planned uses. It appears that this arrangement can be made within the framework of the existing water laws, but continuing consideration should be given to changes in the State water laws which ultimately may be desired.

(17) Personal income in the basin is lower than that for most areas of the Southeast, but per capita income is expected to rise rather rapidly with optimum resource development. The land and water resource developments needed to support the area growth can be financed within the limits of available income. A slight increase in the portion of income devoted to such developments will be necessary during the 1960-75 period with a smaller portion during the 1976-2000 period than that used in 1960.

(18) Activities in all parts of the basin are rather closely related to the existence, development, and use of the Suwannee River and its main tributaries. Thus, seemingly local developments are in reality of interest to many areas, and there is a real and continuing need for areawide planning and for coordination of local planning.

(19) Much of the plan is based on reconnaissance-type information. The plan will have to be reviewed and refined, either on a continuing or periodic basis, if it is to be kept abreast of changing conditions and information and thus serve its intended purpose. Lack of topographic, geologic, economic, and other basic data is a handicap to resource-use planning in the area. Steps need to be taken, at all levels, to obtain better basic data and basic data analyses.

(20) Resource developments needed to support the basin economy at satisfactory levels are well within the limits of the physical, economic, and institutional abilities of the basin and its people. The projects and programs described in Part Four provide a basic, comprehensive, and integrated plan of development of the land and water resources of the basin. Their development, with adjustments and revisions growing out of more detailed studies, should assist greatly in obtaining optimum public benefits from use of the area resources.

PART SIX – LOCAL, STATE, AND FEDERAL PARTICIPATION AND ASSISTANCE

Acknowledgments

The U. S. Study Commission, Southeast River Basins, gratefully acknowledges the assistance and cooperation of the following:

Alabama

Department of Agriculture; Auburn University; Department of Conservation; State Docks Department; Extension Service; Division of Forestry; Geological Survey; Department of Public Health; Highway Department; State Planning and Industrial Development Board; Department of Labor; Pilotage Commission; Public Service Commission; River Development Board; Soil Conservation Committee; Soil Conservation Districts; and Water Improvement Commission.

Florida

Department of Agriculture; Board of Conservation; Development Commission; Extension Service; Florida State University; University of Florida; Forest Service; Game and Fresh Water Fish Commission; State Board of Health; Industrial Commission; Inland Navigation District; Board of State Parks and Historical Monuments; Railroad and Public Utilities Commission; Road Department; Soil Conservation Board; Soil Conservation Districts; and Suwannee River Water Conservation Authority.

Georgia

Department of Agriculture; Bainbridge Port Authority; Brunswick Port Authority; Extension Service; Forestry Commission; Game and Fish Commission; University of Georgia; Georgia Institute of Technology; Georgia State College; Georgia Southern College; Department of Public Health; Highway Department; Department of Industry and Trade; Jekyll Island State Park Authority; Department of Labor; Department of Mines, Mining, and Geology; Department of State Parks; Georgia Ports Authority; Public Service Commission; Savannah District Authority; Soil and Water Conservation Committee; Soil and Water Conservation Districts; Tidewater Commission; Waterways Commission; Water Quality Council; and Water Resources Commission.

North Carolina

Extension Service; State Board of Conservation and Development; Highway Department; North Carolina State College; Western North Carolina Regional Planning Commission; Soil Conservation Committee; Department of Water Resources; Soil Conservation Districts; and Wildlife Resources Commission.

South Carolina

Department of Agriculture; Clemson College; Development Board; Extension Service; Forestry Commission; State Board of Health; Department of Labor; Congaree Navigational Study Committee; Parks Commission; Ports Authority; Public Service Authority; Public Service Commission; Soil Conservation Committee; Committee for Water Development; Soil Conservation Districts; Water Pollution Control Authority; and Wildlife Resources Department.

General

Altamaha Development Association; Middle Chattahoochee Development Association; Upper Chattahoochee Development Association; Choctawhatchee-Pea Development Association; Council of State Governments; Southern Regional Education Board; Southeastern Power Committee of Electric Membership Cooperatives of Nine Southeastern States; and Three Rivers Development Association.

Federal

U. S. Department of Agriculture—Agricultural Marketing Service, Agricultural Research Service, Agricultural Stabilization and Conservation Service, Economic Research Service, Farmers Home Administration, Forest Service, and Soil Conservation Service; U. S. Department of the Army—Beach Erosion Board, Board of Engineers for Rivers and Harbors, Corps of Engineers,

and Military Posts; Atomic Energy Commission; Atlanta Federal Reserve Bank; U. S. Civil Service Commission; U. S. Department of Commerce—Area Redevelopment Administration, Business and Defense Services Administration, Bureau of the Census, Office of Business Economics, Bureau of Public Roads, Small Business Administration, and Weather Bureau; Federal Power Commission; General Services Administration; U. S. Department of Health, Education, and Welfare—Public Health Service; Housing and Home Finance Agency; U. S. Department of the Interior—Bureau of Commercial Fisheries, Geological Survey, Bureau of Mines, National Park Service, Bureau of Reclamation, Bureau of Outdoor Recreation, Southeastern Power Administration, and Bureau of Sport Fisheries and Wildlife; U. S. Department of Labor—Bureau of Labor Statistics; U. S. Department of the Navy—Sixth Marine Corps Reserve and Recruitment District; Executive Office of the President—Bureau of the Budget, and Public Works Planning; Outdoor Recreation Resources Review Commission; Advisory Commission on Intergovernmental Relations; Select Committee on *National Water Resources, U. S. Senate, 86th Congress*; Smithsonian Institution; U. S. Study Commission—Texas; and Tennessee Valley Authority.

In addition, the Commission gratefully acknowledges assistance received from numerous county and municipal governments, planning commissions, development commissions, chambers of commerce, corporations, trade associations, interested individuals, press, radio, television, and professional societies.

Public Hearings and Presentations

A series of public hearings were held early in the investigation to secure the views and desires of various interests, organizations, and individuals. These hearings were held at Tallahassee, Florida, on November 16, 1959; at Dothan, Alabama, on November 17, 1959; at Macon, Georgia, on November 18, 1959; and at Anderson, South Carolina, on November 19, 1959.

During the latter stage of the studies, a series of public presentations were held to acquaint the public with the proposed plan of the Commission for development of the land and water resources of the Southeast River Basins; to inform Federal, State, local, and private interests of their responsibility in implementing the developments proposed; and to solicit views and opinions on the proposals under active consideration. These presentations were held as follows:

Place	Date
Statesboro, Georgia	March 20, 1962
Waycross, Georgia	March 23, 1962
Tallahassee, Florida	May 15, 1962
White Springs, Florida	May 17, 1962
Valdosta, Georgia	May 18, 1962
Geneva, Alabama	June 19, 1962
Pensacola, Florida	June 20, 1962
Savannah, Georgia	July 16, 1962
Clemson, South Carolina	July 17, 1962
Atlanta, Georgia	August 13, 1962
Columbus, Georgia	August 14, 1962
Albany, Georgia	August 14, 1962
Baxley, Georgia	August 15, 1962
Macon, Georgia	August 16, 1962
Athens, Georgia	August 17, 1962

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